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American Machinist

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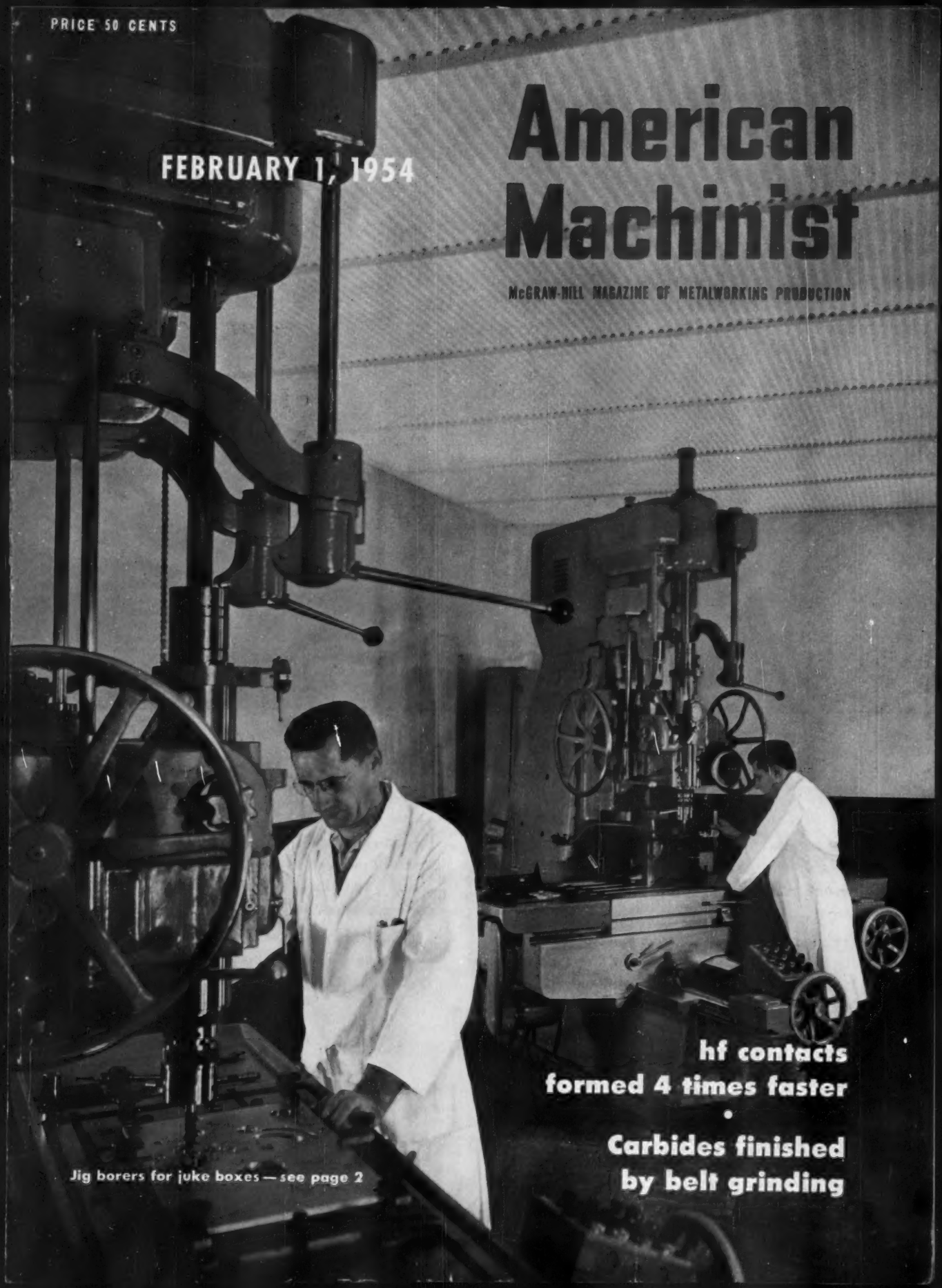

hf contacts formed 4 times faster

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Carbides finished by belt grinding

Jig borers for juke boxes—see page 2

The mooring mast that was never used!

IN MID MANHATTAN there stands a monument to a dream. A 1250-foot mooring mast that was never used!

When the Empire State Building was designed, the huge rigid-frame dirigible looked like the coming thing in air transportation. So, atop the world's tallest building, they placed a giant mooring mast. Yet before the building was finished, so was the dirigible balloon!

Why? It was knocked out of the race by the oldest law on the books. Darwin called it the survival of the fittest. We call it competition, but it means the same thing. In today's highly competitive market, it means that new ways *must be found* to produce a higher quality product, at lower cost.

That's where latest Heald equipment and a fresh Heald viewpoint can help you come out ahead in the struggle for survival. Long runs or short, single or multi-purpose setups, Heald machines provide a sure way to improve product quality, speed production and cut unit costs.

Competition is wonderful if you're *ahead* of it. Our business is to help keep you there. That's why IT PAYS TO COME TO HEALD.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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chips

JIGS FOR JUKE BOXES . . . To assure good conditions for precision production jig boring, Seeburg Corporation, Chicago, built a special room to house three Fosdick 42-P jig borers with automatic positioning. The room, 24 x 27 ft, has blue and yellow plastic-panel walls and gray asphalt flooring. Air is circulated and filtered under pressure, and a completely diffused lighting system is built into the ceiling. Seeburg makes automatic coin-operated record players ("juke boxes") in which close tolerances are maintained in cast parts, largely of aluminum. Mating surfaces are usually lapped and scraped. Large die blocks and fixtures are produced on these machines, as well as production parts to tolerances of 0.0001 in. End-measuring rods made to specific dimensions permit such repeated accuracy, and greatly reduce assembly problems with close-fitting gear trains, now brought to a point at which they approach complete interchangeability.

CONTACTS AND GUIDES . . . Hewlett-Packard on the West Coast evolved a new method for making uhf contacts of beryllium copper. We bring it to you as a sequence of pictures. Here are latest production ideas on electronic parts, and several tricks.

BELTS ON CARBIDE . . . F J Lennon, Jr, general superintendent of Kennametal, is back again, this time with a report of extensive tests on belt grinders for carbide tools. Results, suggested by photomicrographs, show the method is satisfactory, but currently more costly per tool than diamond wheels. Further development may cut the cost per tool, of course, but at least a good alternate method is available for emergencies.

DOOR TO HIRING . . . A number of West Coast companies around Los Angeles have banded together to form Mutual Employers Assn, a hiring cooperative. No plant has more than 350 workers, but all get the benefits of big-shop personnel analysis, testing, and other elements. The plan gives small plants everything a big one gets in pre-evaluating.

LUGS . . . Westinghouse at Lima, Ohio, has embossed lugs on governor weights. This little design change makes it possible to inspect automatically, so a 2-step gage can reject parts overweight or underweight — by size. The story is in a single page.

ACRYLICS . . . Often troublesome to machine, acrylic plastics (Plexiglas, Lucite, etc) yield to proper techniques. Our current Special Report tells you how to turn, drill and blank acrylics, how to anneal them to avoid crazing, and gives recommendations for band, jig, and circular sawing of various thicknesses. Drill-point angles and the design of steel-rule dies for blanking are covered, too, in data from Rohm & Haas.

COMING . . . Feb 15 *AM* has an unusual Special Report—a summary of subcontracting procedure from GE. There are also articles on design and use of special machines, on electrolytic grinding, Communist machine tools, barrel finishing, a screw machine converted for gun drilling, on gaging bores, on developing your own engineers, and a discussion of what should be done in college shop courses. The cover will be startling to everyone except a Californian.

METHODS MAN . . . Corwin S Selby, author of our article on forming beryllium copper "shorts" for UHF equipment in this issue, has been a production engineer with Hewlett-Packard Co for over six years, during which time he has worked on production methods and cost reduction. He is a native of Boulder, Colorado, and a graduate of the University of Colorado with a BS degree. His background is heavily electronic; including U S Navy service as an electronics officer following graduation from the Navy Radio Materiel School, Naval Research Laboratory, Washington, D C.

for the first time . . .

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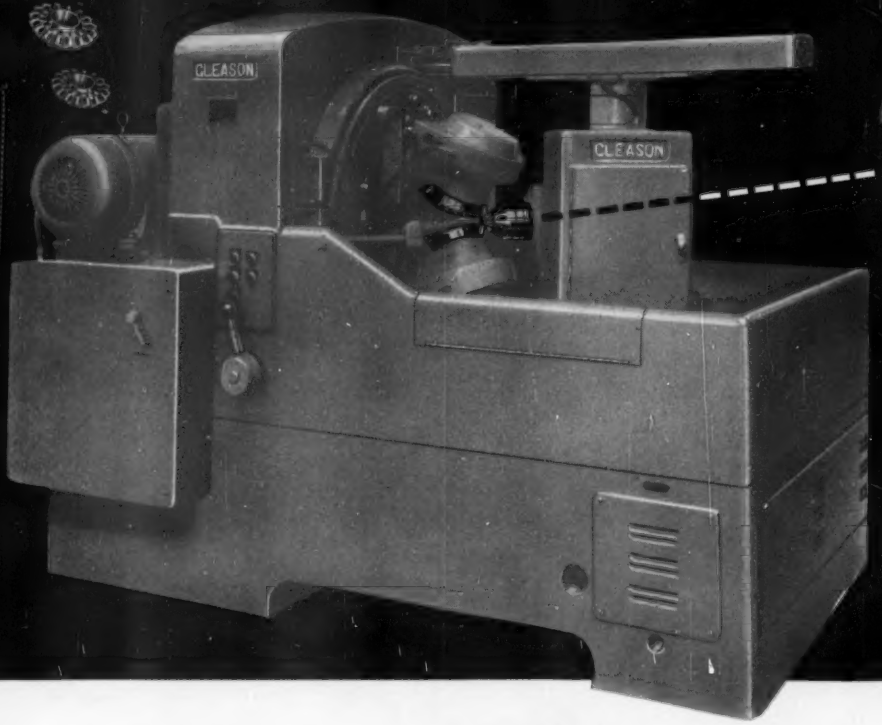

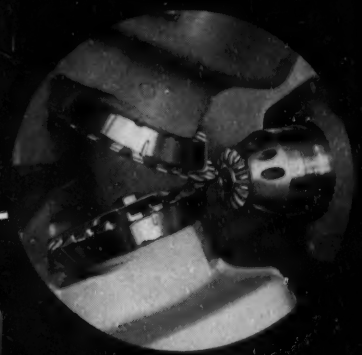

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DISC-TYPE CUTTERS
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For all bevel gear design and production problems, Gleason Engineering Service is available throughout the world. Please submit prints and complete data.

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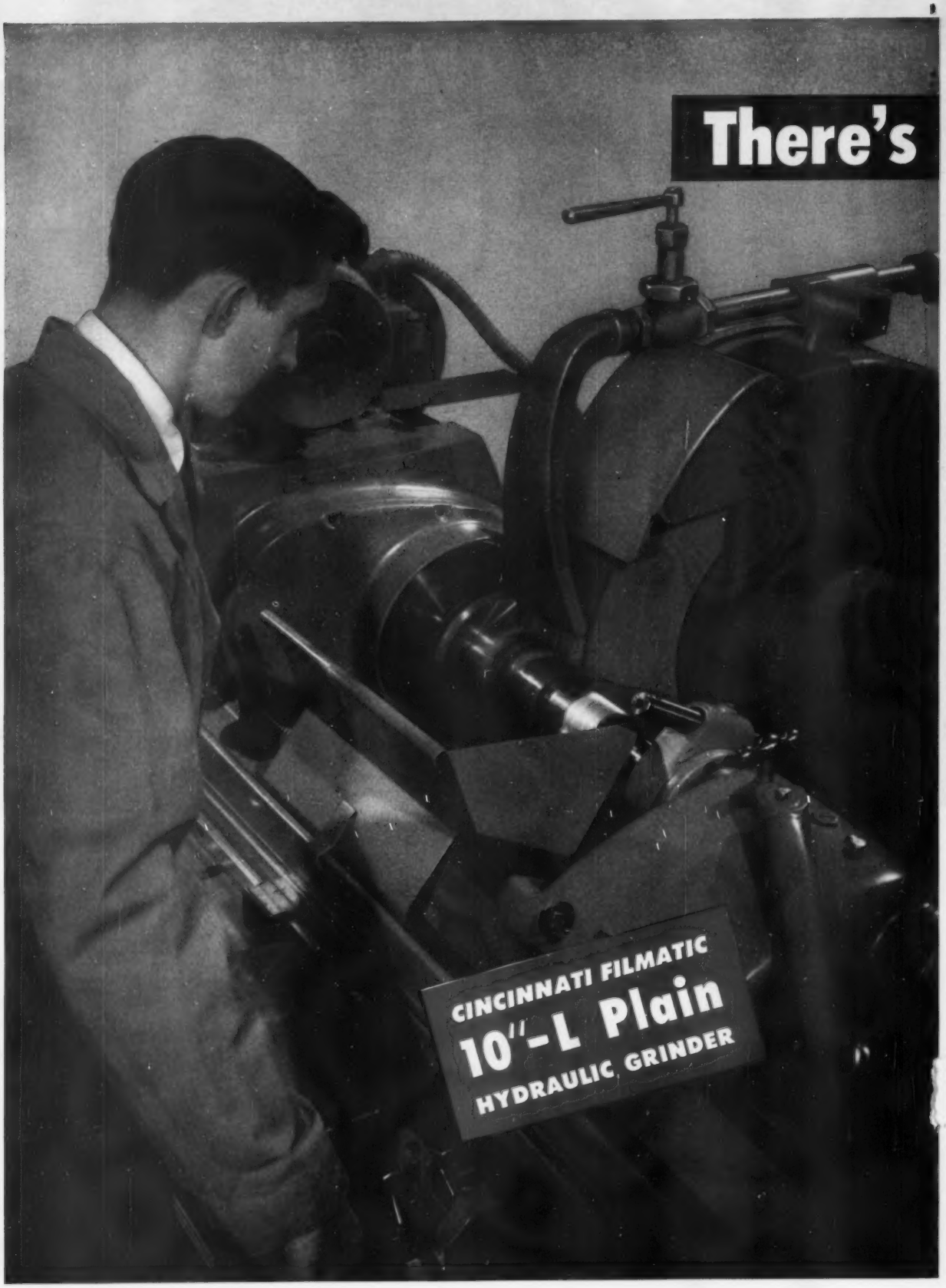
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HYDRAULIC GRINDER

No Time Like the Present

To Replace Your Worn-Out Plain Grinders

Proper timing spells success in farming, driving a golf ball, making an investment. Proper timing in replacing shop equipment is right now . . . right now while business is good and deliveries of many types of machine tools have improved. ¶In the field of precision centertype grinding, machines that no longer earn their keep should be replaced now, and your best replacement bet is CINCINNATI FILMATICS. For example, consider the medium-sized group, 6", 10"-L, 10" and 14"-L. There are many reasons why these machines should be your first choice:

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FILMATIC

You can reduce the cost of a variety of grinding operations, like the one shown at the left, by replacing old equipment with new CINCINNATI FILMATIC Plain Hydraulic Grinders.

CINCINNATI FILMATIC No. 10"-L Plain Hydraulic Grinding Machine. Catalogs No. G-566-2 and No. G-603 contain complete data on the medium-sized group. Write for copies.

a) Grinding wheel spindle bearings are FILMATICS. They are dependable . . . require no adjustment, and run for years without attention.

b) Accurate table reversal within .004"; for safely grinding close to shoulders.

c) Two-speed manual table and cross traverse; for convenience in setting up the machine.

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Conveniently grouped, easily manipulated control elements; filtered, pressure lubrication for ways; infinitely variable table traverse rates of 3" to 240" per minute; V-belt and silent chain headstock drive, for smooth rotation of headstock spindle; these and many other advantages are yours with CINCINNATI FILMATIC Plain Hydraulic Grinders. Compare new CINCINNATI'S with your old plain grinders and you'll see why it will pay you to replace now. Complete data in catalog Nos. G-566-2 and G-603, or look in Sweet's File for Mechanical Industries.

CINCINNATI GRINDERS INCORPORATED

(Subsidiary of The Cincinnati Milling Machine Co.)

CINCINNATI 9, OHIO

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CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
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HIGH-QUALITY GEARS . . . *and* 93

Fellows

cubic inches of

STOCK REMOVAL

PRODUCTION DATA
Pitch diameter 25.330"
Diametral pitch 3
Width of gear face 4"
Number of teeth 76
Cutter strokes per min. 86
Feed per stroke of cutter .0075"
Depth of roughing cut .640"
Depth of finishing cut .100"
Cutting time (2 cuts) (258 min.)

QUALITY gear jobs of broad variety gravitate to the 36-Type Fellows Gear Shaper — out in the Hoosier State as well as in others east, west, north and south.

It is our good fortune to be able to picture three 36's in the Fairfield Manufacturing Company's line-up of 26 Fellows machines in their plant at Lafayette, Indiana. With them, precision and controlled costs are paramount considerations, a fact well understood and appreciated by Fairfield's wide spread of customers.

As typical of the fine work-planning (and machine performance) we give you the following report-in-detail about the heavy-duty gear being cut on the Gear Shaper nearest the camera. The gear is finished from the solid in two cuts, without a subsequent shaving operation. The blank weighs 156 pounds, and is of 4620 SAE steel. Roughing and finishing is done at the same setup, with the same Fellows cutter. Ninety-three cubic inches or 26 pounds of stock are removed—to produce fine-finish, high-quality gears.

If you aim to put quality into fine or coarse pitch gears, of dimensions best handled on a heavy-duty machine (this includes big coarse-pitch pinions, naturally), the Fellows "36" is something to investigate. » *Speeds and feeds quickly adjustable via shift-lever settings. Cutter stroke variable up to 6 inches. Mass rigidity throughout invites fast, heavy cuts.* » *The nearest Fellows office is your point of contact. Informative literature is available.*

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For "FLEX-ABILITY", the new heavy adjustable cutterhead, new larger extended ram and heavy knee with front and rear directional power and manual feed controls. Ram extends to its maximum range of 29". New design permits maximum cuts within entire ram range.

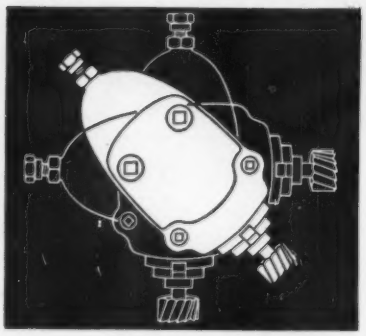
Write for complete details on the new, modern Van Norman No. 38M Ram Type Milling Machine.

No. 38 M

Table: 64" x 14"
Spindle Motor: 10 HP
Feed Motor: 1½ HP

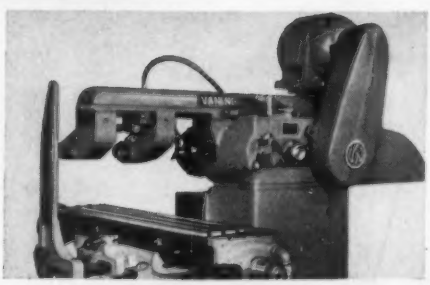
Interested in Extra Vertical and Table Range: See Your Van Norman Dealer

LOOK AT THESE "PLUS" FEATURES FOR MAXIMUM "FLEX-ABILITY"



Adjustable cutterhead permits horizontal, angular and vertical milling on one machine. Reduces work reset-ups, eliminates idle machine time.

Machine shown with overarm, arbor supports, and outerbrace.



VAN NORMAN makers of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

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These Diversimatic® Features Cut Grinding Costs!

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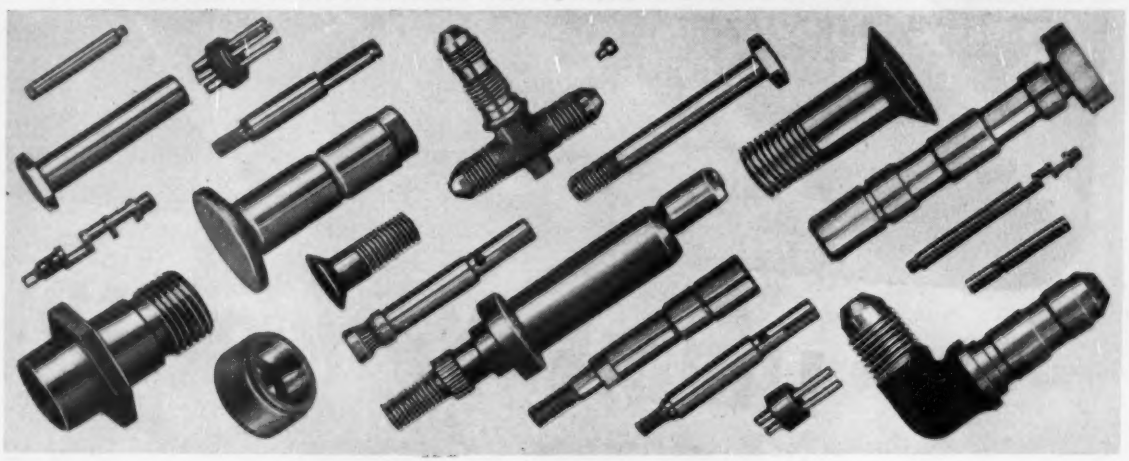
- Spindle requires no warm-up period.
- Grinding wheel and regulating wheel dressers hydraulically-operated.
- Infinitely variable ¼ h.p. regulating wheel drive, 15 to 800 r.p.m.

Get the full facts. See how this versatile grinder can cut your grinding costs on small shafts, formed shapes, parts of two or more diameters or special contours.

CENTERLESS GRIND PARTS LIKE THESE FASTER, MORE ECONOMICALLY ON THE DIVERSIMATIC



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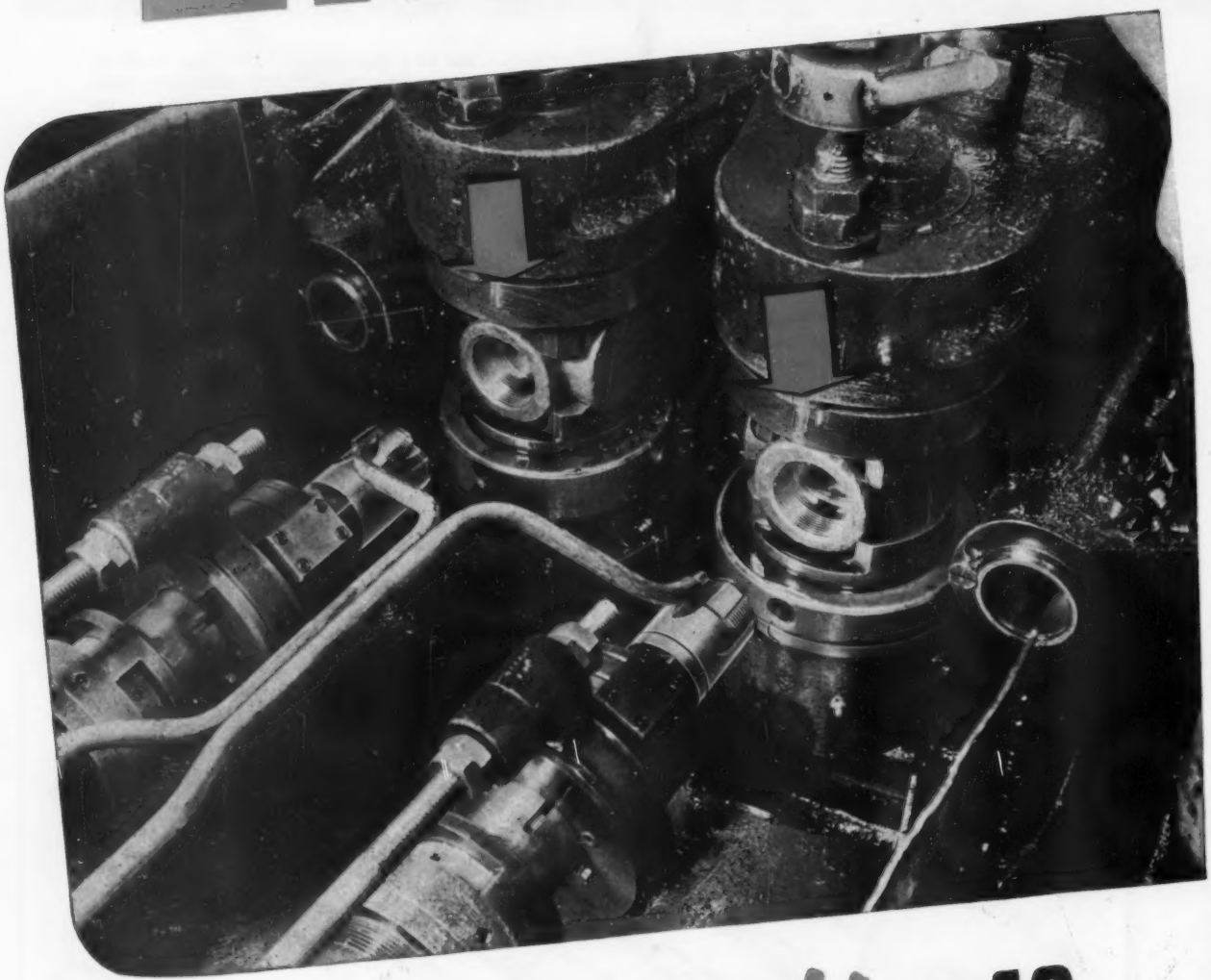

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331C

TAP

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In the illustrations, LANDIS LL Rotary Taps on a special drilling and tapping machine are threading W-S 2" 90° Pipe Elbows. 2" 11½ pitch ASTP threads are tapped in steel forgings at the rate of 35 surface feet per minute. Even at this speed 4000 threads are completed between chaser grinds, holding tool cost and downtime to a minimum.

LANDIS LL Taps are designed for the high-speed production of precision tapered threads. The taper of the threads is mechanically controlled by the receding action of the chasers. Cutting strains are thereby reduced, thread accuracy and finish improved, and chaser life lengthened. The design of the ALM Head features unevenly spaced chasers which provide maximum rigidity and prevent chatter.

Detachable heads allow each size of Tap to produce a wide range of thread diameters. For example, the 2" LL Tap with different size heads will cut pipe threads from 1" to 2½". Both Rotary and Stationary models are built in sizes up to 13⅜". For further information, send specifications and ask for Bulletin G-95.

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Low Cost Precision Grinder

For General Purpose Grinding

LANDIS 12" x 28" Grindwell
for manufacturing, maintenance,
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precision grinders

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Fine Finishes

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8. Precision coarse or fine wheel feed
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10. Swiveling headstock, wheel base and work table

for detailed information, specifications and extra equipment available, write for Bulletin S-49

LANDIS TOOL COMPANY
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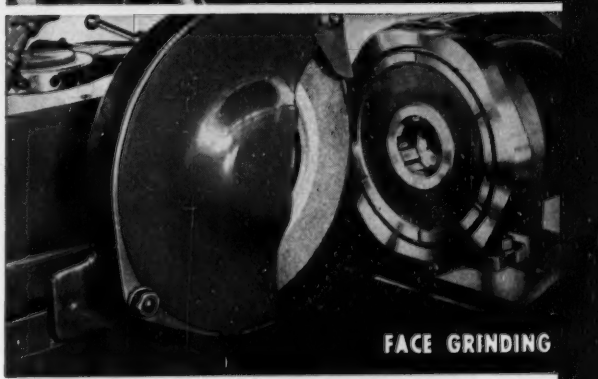
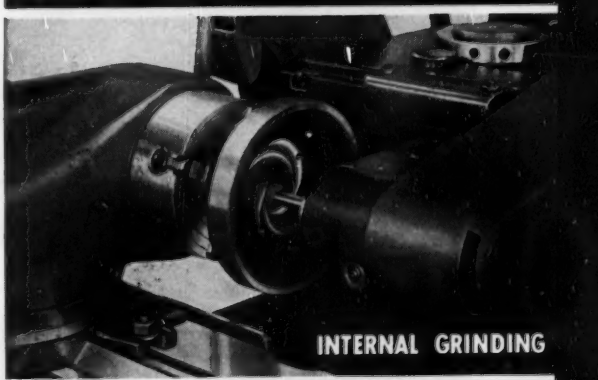
STRAIGHT GRINDING

TAPER GRINDING


FACE GRINDING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Dual personality...

with one idea in mind—profit!

Both metal hog, and tolerance miser — this versatile machine's only goal is turning out better work faster. It's the G&L 350-T Horizontal Boring, Drilling and Milling Machine

HERE'S how this ultra-precision, 30 Series table-type machine helps you increase boring, drilling and milling efficiency. First of all, its open construction and rigidity allow you to handle either large or small work with equal precision on a production or custom run basis.

Furthermore, it's exceptionally versatile. Take the helicopter rotor hub job, illustrated at left, as an example. Here a 350-T helped produce a complex 250-lb. finished part from 3000-lb. forging . . . yet maintained tolerances to .0007"!

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For complete details on this 5" spindle, 25-hp machine — or for information on all G&L quality-built Horizontal bars with 3-4-5-6 or 7" spindles; in table, floor or planer types — contact your G&L representative or write —

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Photo courtesy of Magna Mill Products, South Gate, Calif.

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CHROME CARBIDE
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Finish on Van Keuren gages in either tungsten carbide or chrome carbide will average .5 RMS or better. These gages are available in Class Y, X, and XX accuracies at moderate prices and on a reasonable delivery basis.

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LINK-BELT Silent Chain Drives
assure 3 big bonus benefits

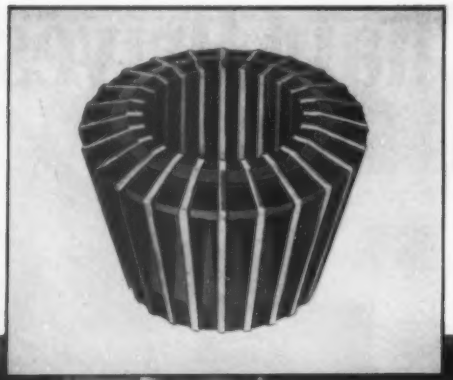
WHEN you buy a drive, you expect it to operate efficiently throughout its entire life. And with Link-Belt Silent Chain, you're assured of better than 98% *sustained* efficiency throughout its many years of service! What's more, these positive, no-slip drives are low in first cost . . . low in operating costs. And, with their ability to operate at higher speeds, you can reduce your investment in motors and controls. Link-Belt Silverstreak Silent Chain Drives are available from fractional to thousands of hp. You can obtain ½ to 50 hp drives (ratios of 1:1 to 7:1) from stock. Get complete information from your Link-Belt sales office or distributor.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

13,242

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.



Once again!...

Jacobs doubles

production rate—gets the

"TOUCH of GOLD"

Leading chuck manufacturer uses Norton machines to cut grinding time in half

When a leader like The Jacobs Manufacturing Company selects equipment, you can be sure that this equipment has had careful study from every angle of performance and cost.

That's why Jacobs' choice of Norton grinding machines is worth serious consideration when *you* are buying grinding machines.

In producing their famous Rubber-Flex Collets, for example, Jacobs reports that switching from separate operations to a single operation on Norton Type CTU Semiautomatics with multi-wheel mounts has doubled their production rate. *Jacobs reported similar production savings in grinding chuck bodies on the same type of Norton machines.*

Another manufacturer has boosted production from 300 to 600 parts per hour by grinding 2 diameters at once on a Norton machine. Still another reports that a Norton grinding machine with a triple-wheel mount has upped his production rate 128%. Throughout industry, manufacturers are using Norton grinders and lappers to provide the "Touch of Gold" that means time, work and money saved in grinding operations.

The "Touch of Gold" in Your Own Grinding

means the same profit-increasing advantages. And remember: only Norton offers you such long experience in both grinding wheels and machines to assure this "Touch of Gold" that helps you produce more at lower cost.

For further facts, see your Norton Representative, or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: West Hartford • New York (Teterboro, N. J.) Cleveland • Chicago • Detroit

The "Touch of Gold" at Jacobs. One of the Norton 6" Type CTU Semiautomatic Grinding Machines used by The Jacobs Manufacturing Company of West Hartford, Connecticut, to grind metal inserts in the famous Rubber-Flex Collets. The basically fast action of this Norton grinder, the multi-wheel mount, special swivel table arrangement and wheel-truing device provide a single setup for traverse and shoulder grinding operations that boosts production rate 100%.

CUT ANY METAL to close

Stroboscopic photo "stops" wheel for 1/10,000 of a second. (Guards removed to show detail.)

continually putting more sense in your abrasive dollar...

"Carborundum" and "Carboflex" are trademarks of The Carborundum Company, Niagara Falls, N. Y.

tolerance . . . IN SECONDS!

with Abrasive CUT-OFF Wheels by CARBORUNDUM

Cut off any metal in seconds . . . ferrous or non-ferrous . . . annealed or unannealed . . . in solid bars, thin or heavy walled tubes, or sheets up to 4″ thick . . . with Abrasive Cut-Off Wheels by CARBORUNDUM. The right wheel on the correct machine cuts from 12 to 20 times as fast as a power hacksaw, eliminates extra grinding, milling or other finishing operations usually required after shearing or flame cutting. You can figure on 6 seconds per square inch as average cut-off time on solid steel bars with up to 3 square inches of cutting surface, for example.

RUBBER BOND CUT-OFF WHEELS by CARBORUNDUM for wet cutting hold tolerances to thousandths . . . produce smooth, clean cuts free from burr or discoloration. CARBORUNDUM® Brand Rubber Cut-Off Wheels are made as thin as 0.005″—for slitting fountain pen points and similar small, close-tolerance applications; and as large as 26″ in diameter—for heavy cutting off operations in steel mills and other metalworking industries.

CARBOFLEX CUT-OFF WHEELS are the newest in CARBORUNDUM's complete line. They are fabric-reinforced to give adequate safety in themost severe cutting off operations. They cut fast, effectively . . . are best for portable operations, such as cutting or slotting gates and risers, undercutting heavy welds, and general cut-off and slotting. CARBOFLEX Cut-Off Wheels are available in diameters from 6″ to 20″—in both Silicon Carbide and Aluminum Oxide.

RESINOID BOND CUT-OFF WHEELS by CARBORUNDUM for dry cutting at high speeds do an effective job when fast production is more important than quality of cut—and when initial investment in cut-off machines must be kept low. On 1″ diameter bar stock you can hold length to plus or minus .020″ with ease, because CARBORUNDUM® Brand Resinoid Cut-Off Wheels are scientifically controlled in manufacture to insure balance, running truth and straightness.

YOUR CARBORUNDUM DISTRIBUTOR OR SALESMAN is ready to assist you . . . to put abrasive cutting to work, profitably, in your plant. Call him today—he's listed under "Abrasives" or "Grinding Wheels" in the yellow pages of your telephone directory. Or write to The Carborundum Company, Dept. AM 81-43, Niagara Falls, N. Y.

CARBORUNDUM

81-43

POWERED FOR

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

PRODUCTION

WARNER & SWASEY Saddle Type Turret Lathes deliver tremendous power for the toughest jobs. The one-piece bed, with integrally cast head and VEE-WAYS, carries massive solid weight at the right places. And with diagonal cross-ribbed reinforcing it insures the rigidity that holds accuracy.

You can really hog off tough metal *fast* with any Warner & Swasey Heavy Duty Machine. You can give the job everything that carbide tooling can take.

And along with power, these machines have an industry-wide reputation for *holding* their precision accuracy. Warner & Swasey's are built to provide the right combination of power, speed and accuracy for the most rugged, heavy duty service throughout many years of trouble-free service.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

REPORTER AT LARGE . . . that's what you might call this new Veeder-Root Reset Magnetic Counter . . . adaptable to remote counting from machines or processes to central boards or instrument-clusters, wherever you want to put them. NOW . . . what can your imagination do with these few facts? For the *full facts*, write:

VEEDER-ROOT INCORPORATED

"The Name That Counts"

HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"Counts Everything on Earth"

SUSPENSION BEARINGS at

a fraction of their former cost!

Total floor to floor time for Duplicating Lathe operations **52 minutes**

The technique and production time used in this text were taken from actual performance in two of the nation's leading railroad shops.

A complete time study including all pertinent data is available upon request.

This is only one of the Diesel engine component jobs that "American" Hydraulic Duplicating Lathes are performing at record low cost in many of our leading railroad shops. Never has the need for economies in railroad operation been more urgent. Never has there been a better opportunity for effecting economies in the railroad shop than offered by the "American" Hydraulic Duplicating Lathe.

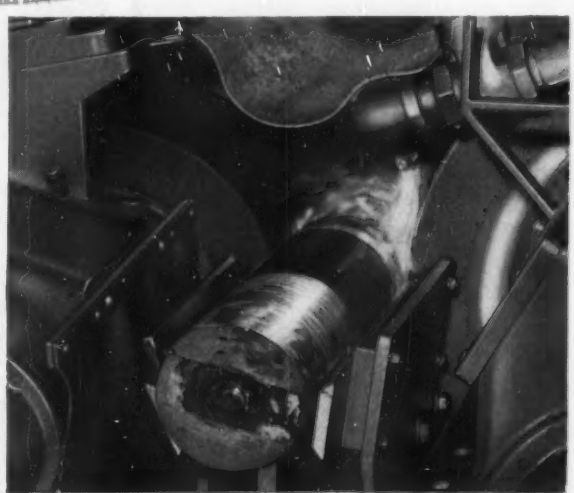
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Here's the grinding wheel that will ABSOLUTELY solve it!

Are you in a predicament over a tough centerless grinding production problem? CINCINNATI Grinding Wheels can get you off that hot spot because they're made to team-up with centerless grinders.

And with a Cincinnati Milling-trained machinist on the job to help you get the most out of



The Thermador Electrical Manufacturing Co., Los Angeles, had tough problem in grinding 4.2 mortar shells. Chatter and burning caused erratic production. For solution, see Case History.

CINCINNATI Grinding Wheels, you can count on the *right answer*–FAST! Here's why:

1 CINCINNATI Grinding Wheels are used by–and *developed* by–Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.

2 Using CINCINNATI Wheels, we've solved hundreds of centerless grinding problems–such as production, roundness, taper, sizing, stock removal, finish and accuracy.

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience based on an entirely new approach to grinding wheels–the development of the grinding wheel as a true cutting tool.

We are so confident–*so absolutely sure*–that CINCINNATI Grinding Wheels can help solve your tough centerless production problem that we make this *unconditional offer:* either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

So contact us at once. We'll send one of our expert machinists–men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless production problem. There is no charge for his service. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

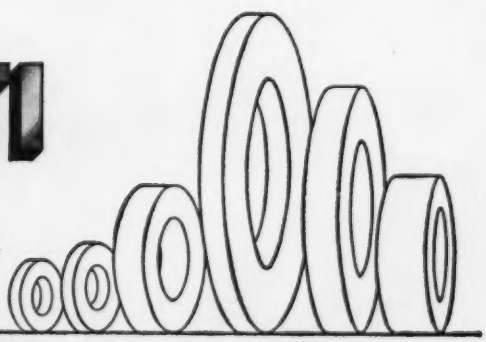
CASE HISTORY No. 217

How CINCINNATI GRINDING WHEELS Solved Tough Centerless Production Problem

The job	Thru feed grind 4.2 mortar shells. Material - resistance welded steel tubing SAE 1030-1050 normalized to 75,000 p.s.i. Stock removal - .010"-.015". Tolerances - size .003, finish 75 r.m.s.
The machine	Cincinnati No. 2 Centerless
The problem	Erratic production caused by chatter and burning.
The solution	A Cincinnati Milling machinist, in collaboration with the customer, Thermador Electrical Manufacturing Company of Los Angeles, worked out the solution — on the job — using a Cincinnati Wheel from local stock. The wheel prescribed was a Cincinnati 2A60-K5-VN, 20" x 6" x 12". In addition to providing the correct wheel, the Cincinnati expert also recommended changing the type dresser, and adjusted the blade angle, work speed and feed rate. Results — all troubles were eliminated and production was not only stabilized but increased!

CINCINNATI GRINDING WHEELS are manufactured in this new, completely modern plant.

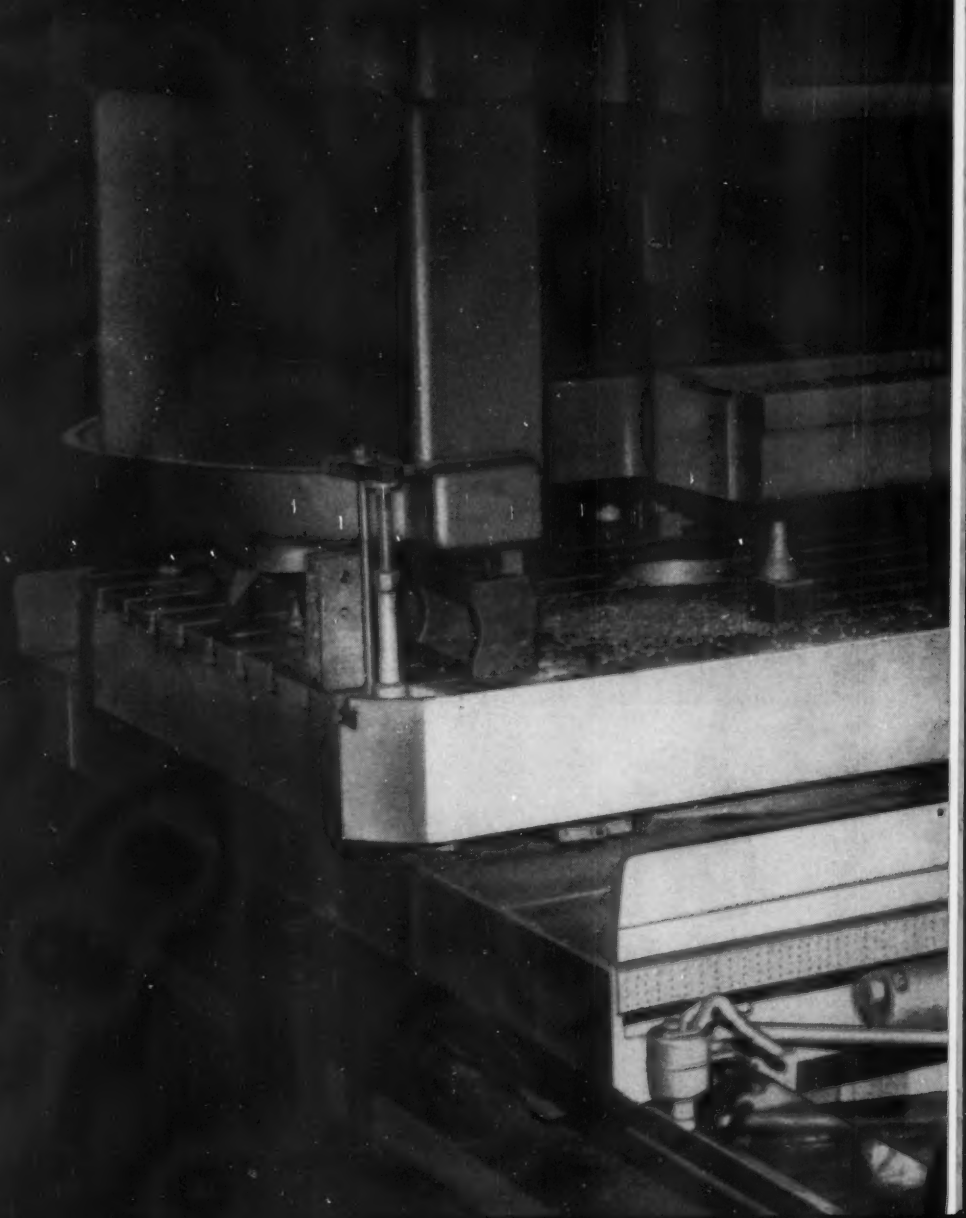
CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



Gentle giant...

The GRAY Horizontal Boring, Drilling, and Milling Machine is a giant for power, yet so precise it works to minute tolerances. GRAY's high precision, simplicity of operation, and modern power are saving production dollars all over the world. Whatever your requirements—a GRAY will do the job better and faster, further proof that *Quality doesn't cost . . . it pays.*

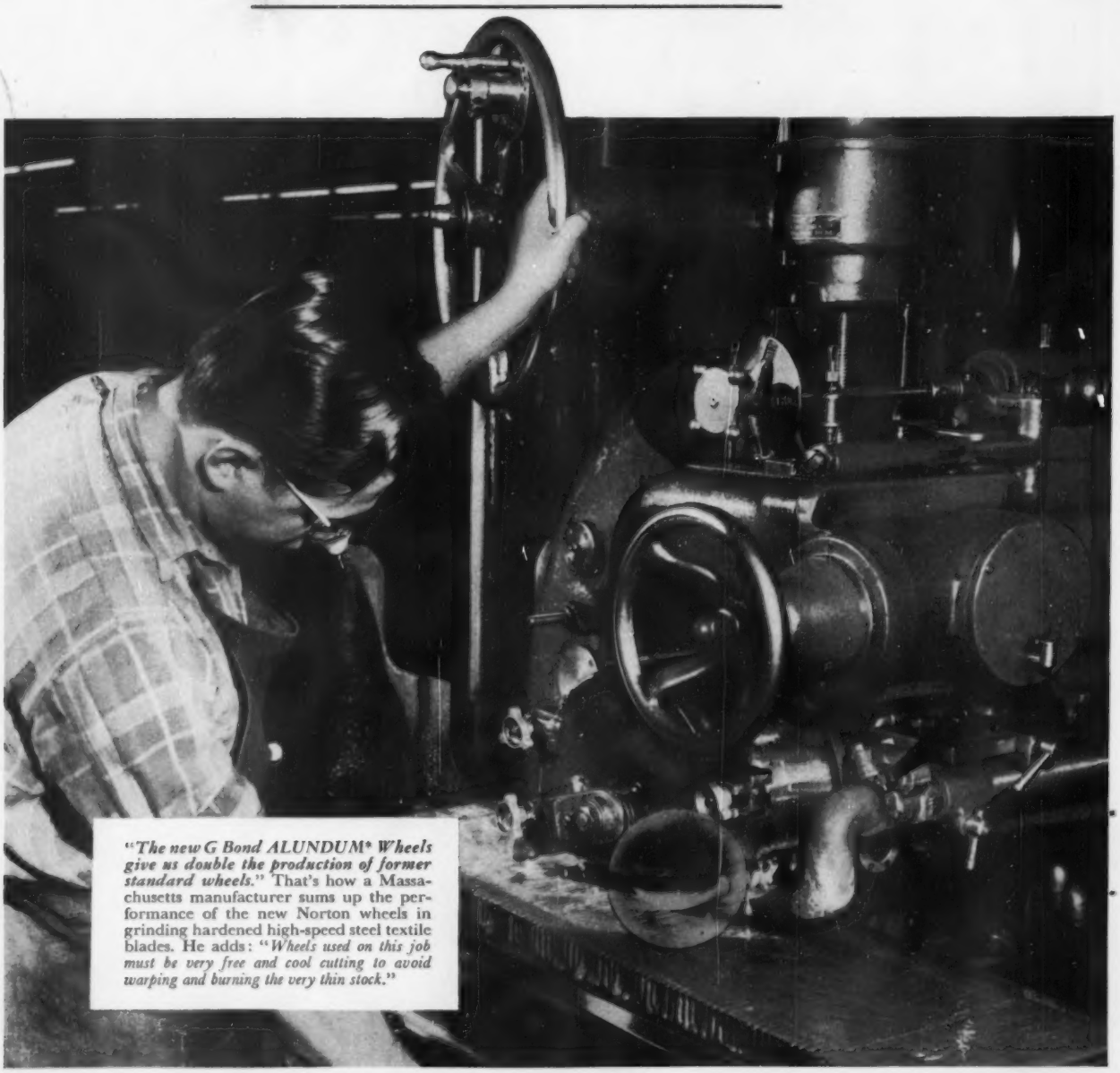
The G. A. GRAY Co., Cincinnati, Ohio.



GRAY

These users say:

For surface grinding, the new G BOND beats them all!



"The new G Bond ALUNDUM* Wheels give us double the production of former standard wheels." That's how a Massachusetts manufacturer sums up the performance of the new Norton wheels in grinding hardened high-speed steel textile blades. He adds: *"Wheels used on this job must be very free and cool cutting to avoid warping and burning the very thin stock."*

Latest Norton wheels bring you the money-saving

"TOUCH of GOLD"

Naturally, we've kept close watch on how the new G Bond wheels are doing. And we can report that throughout the range of precision and semi-precision grinding applications they're already away out in front. In the field of surface grinding, for instance, a composite statement by users of the new G Bond would run very much like this:

"G Bond wheels cut freer, cooler, faster — enabling us to take heavier cuts in costly high speed steels without drawing temper. They give us closer tolerances and smoother finishes. They dress easier and produce more pieces per dressing. Doing more work and a greater variety of work — per wheel, they outlast any wheels we ever used before."

G Bond Wheels for YOUR Surface Grinding

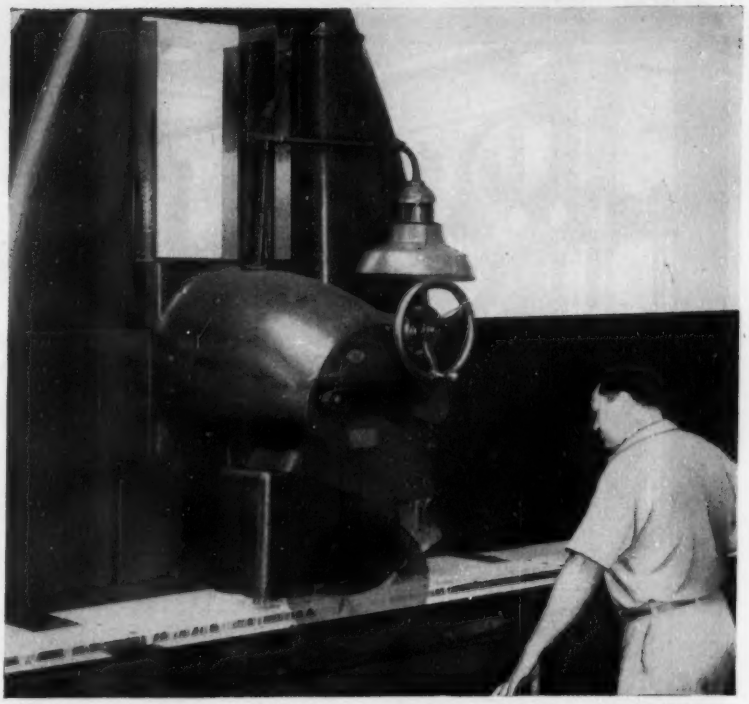
will bring new speed and economy to surface grinding jobs — thanks to their unique grain-holding structure that produces greatly improved cutting action. Remember, the G Bond is the most modern, most efficient vitrified bond ever developed — a typical Norton "Touch of Gold" achievement that steps up grinding performance and product quality while cutting grinding costs.

See Your Norton Distributor

for the ALUNDUM G Bond wheels, cylinders and segments you need. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Inc., Worcester 6, Massachusetts. W-1535

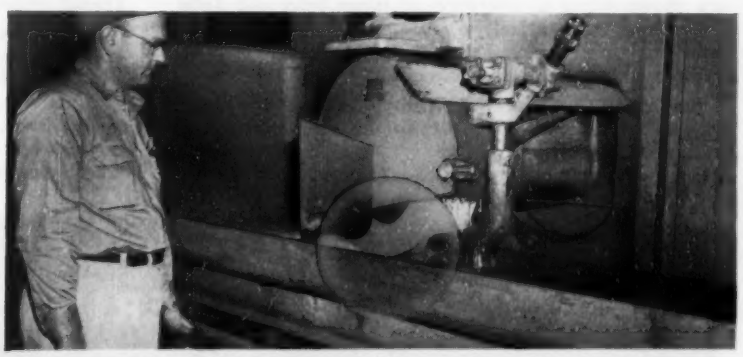
NORTON
ABRASIVES
Making better products . . . to make other products better

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

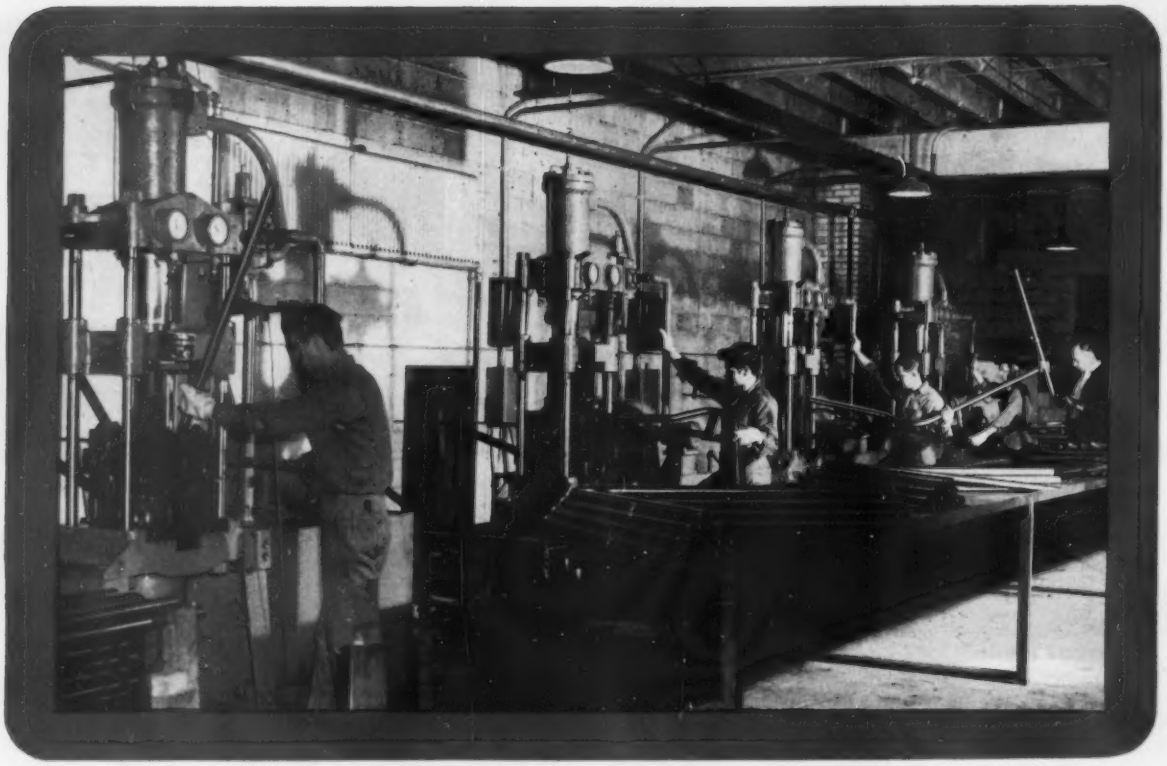


***"Thirty per cent longer wheel life,** freer and cooler cutting, a good finish and more pieces per dressing,"* are G Bond advantages cited by an Ohio machine tool company on this surface grinding job. Material on job illustrated is flame-hardened graphitic tool steel.

***"I get a fast cut and good finish.** They're the best and most versatile segments I ever used for this kind of work and I'm re-ordering ten sets,"* reports an Illinois customer using G Bond segments for surface grinding mild steel, cast iron and Meehanite — all three.



***"We're getting forty per cent more wheel life from G Bond wheels, and they cost us twelve per cent less because now we don't need a premium priced abrasive.** The new bond has proved excellent for grinding our laminated stainless steel and mild steel magnetic chuck plates."* This from a Michigan manufacturer.



BENDING TUBING INTO TAILPIPES . . .

another job done better, faster

on ELMES Hydraulic Presses!

Four 20-ton hydraulic tube benders—one of many types of Elmes Presses built for special metalworking jobs—are shown above in operation at James Steel and Tube Co., Hazel Park, Michigan. Automobile tailpipes, each requiring seven bends, are produced at the rate of 2000 complete units per eight-hour shift.

These small but heavy-duty, high production Elmes Presses are designed especially for bending tubing into automotive exhaust and tailpipes. Their performance has been so outstanding—affording substantial savings in time, effort, maintenance and money—that they are now widely recognized as the logical "first choice" among presses used for this application.

Whether your metalworking press requirements call for special purpose designs, or can be met with standard production equipment, you'll find it always pays to "put your pressing problems up to Elmes." Many others have found it profitable . . . in terms of gaining *press performance at its best!* Ask Elmes engineers to assist you. Recommendations and cost estimates supplied promptly.

American Steel Foundries

ELMES ENGINEERING DIVISION

1141 TENNESSEE AVENUE CINCINNATI 29, OHIO

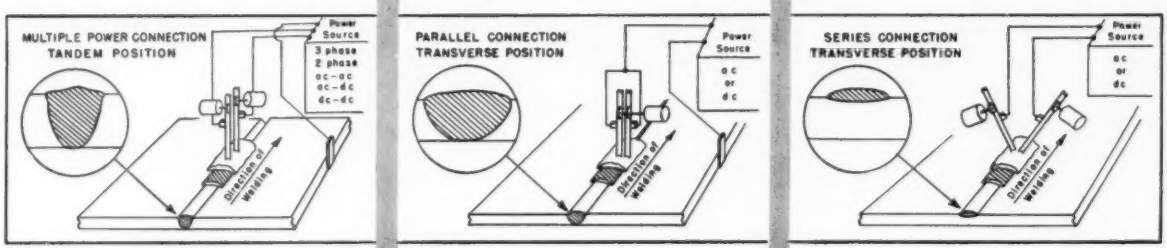
DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS — ALSO MANUFACTURED IN CANADA

METAL-WORKING PRESSES • PLASTIC MOLDING PRESSES • EXTRUSION PRESSES PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.

Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.

Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE'S engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

Linde TRADE-MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Potash Mining

FPG Photo

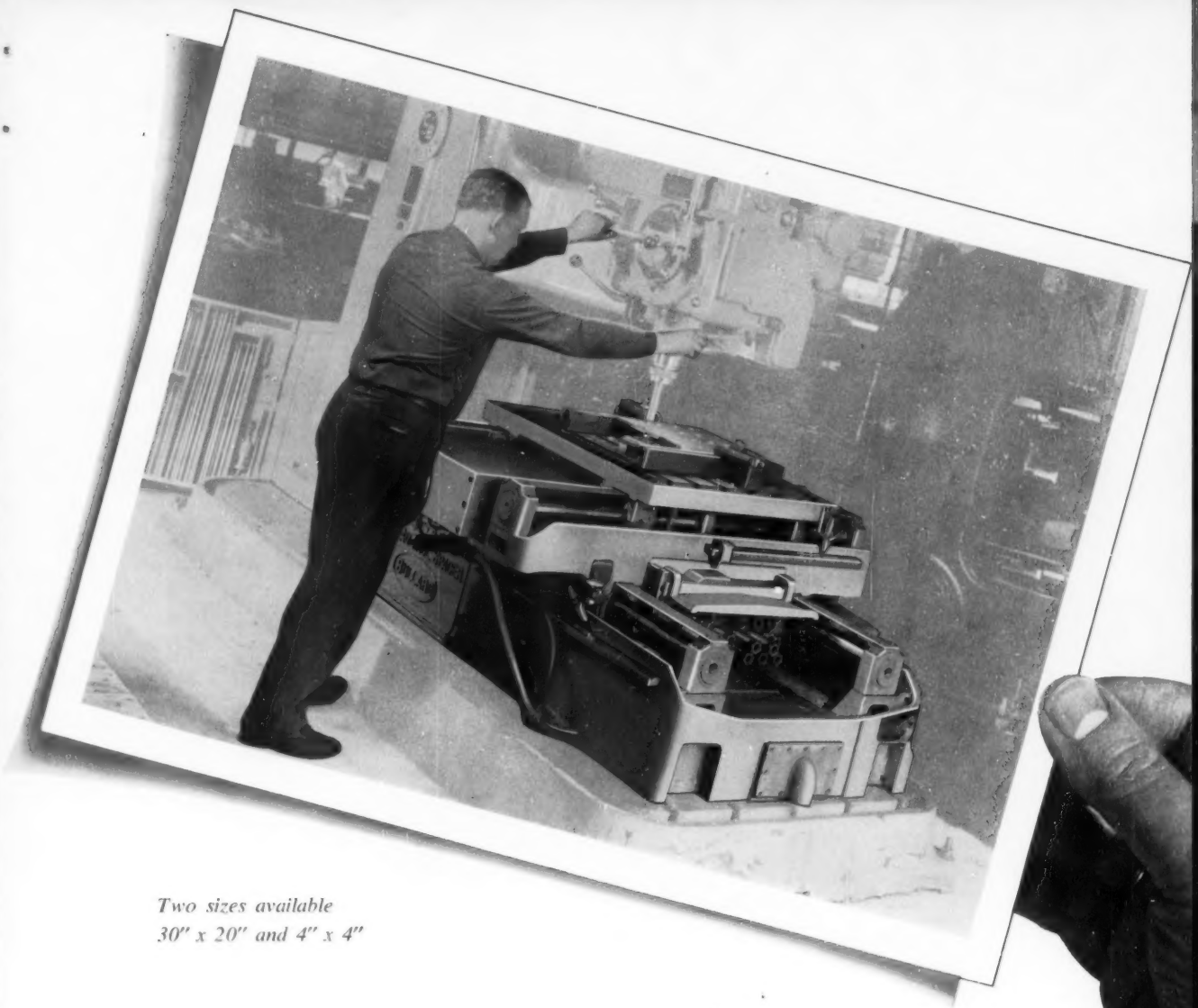
BULLARD

The Invisible Background of Industrial Progress

Potash is a well-known ingredient contained in most commercial chemical fertilizers in use today. Modern agricultural methods prescribe that, to insure farmers a good yield of higher quality produce, it is necessary to replace the loss of basic natural chemicals by means of fertilization. Potash is especially important and necessary in those areas where cotton, tobacco, corn and potatoes are the main crop.

Modern equipment, needed to mine, handle and transport such materials to the consumer at an equitable price, are basically a product of *Modern Machine Tools* — those tools essential in "The Invisible Background of Industrial Progress."

THE BULLARD COMPANY · BRIDGEPORT 2, CONNECTICUT

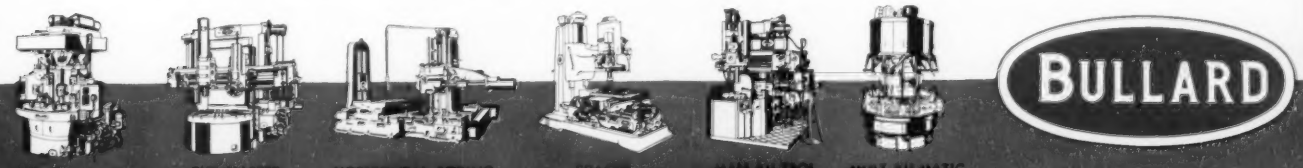


Two sizes available
30" x 20" and 4" x 4"

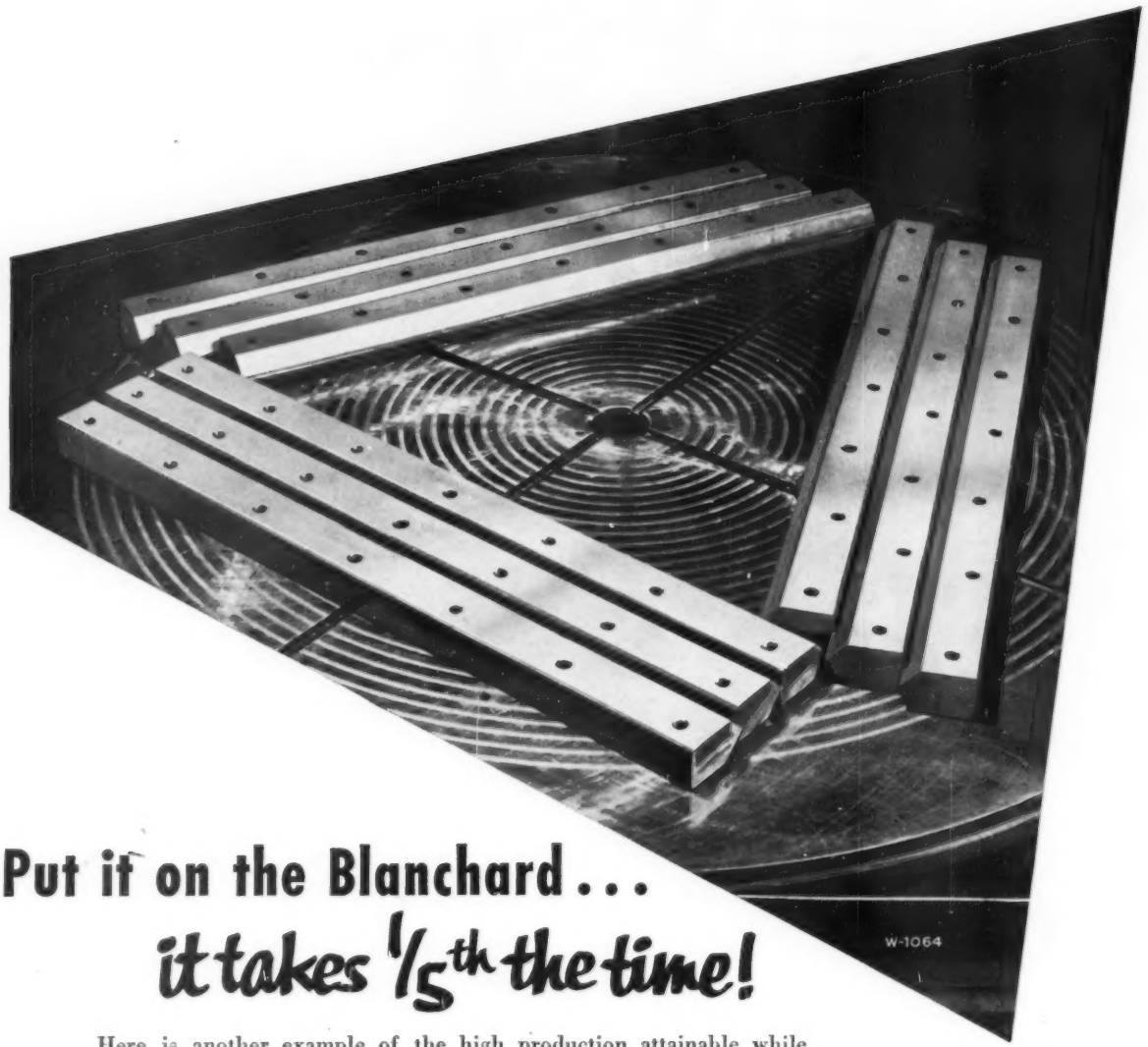
Space your costs by spacing without jigs — eliminate the cost of jig design, maintenance, storage and handling — use a Bullard Spacing Table under a fixed spindle of a Radial Drill or a Cincinnati Bickford Super Service Drill.

The advantages of accurately positioning work under a fixed spindle for any combination of drilling, boring, reaming or tapping operations are: (1) Greater speed and accuracy than is obtainable with jigs. (2) Elimination of the long period required to design and make jigs. (3) Elimination of jig bushings which are subject to continuous wear and generally require repeated replacement. (4) Accuracy is inherently maintained. (5) Simplicity of operation of the Spacer permits the use of semiskilled operators on precision work. (6) Freedom from operator fatigue, since positive locating of the work is done automatically. (7) Extreme flexibility, permitting the use of the Spacer for a large variety of both large and small work. (8) Complete visibility of the work at all times, greatly facilitates inspection.

Ask a Bullard representative to explain the many cost-saving advantages which this Spacer will afford when applied to your work or write to The Bullard Company, 286 Canfield Avenue, Bridgeport 2, Connecticut or phone 6-2511.



BULLARD



Put it on the Blanchard...

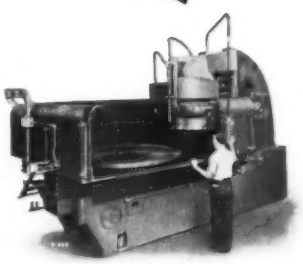
it takes 1/5th the time!

Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

It formerly took 45 hours, floor-to-floor, to grind these nine hardened steel machine tool ways. They are 2½" x 3½" x 50" and hardened to Rockwell C-60-63.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder — nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .1001", flat within .1001" with surface finish of 5 micro-inches. The Blanchard **cut time to 9 hours,** floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".



This is the largest Blanchard Surface Grinder, No. 42-72-84.

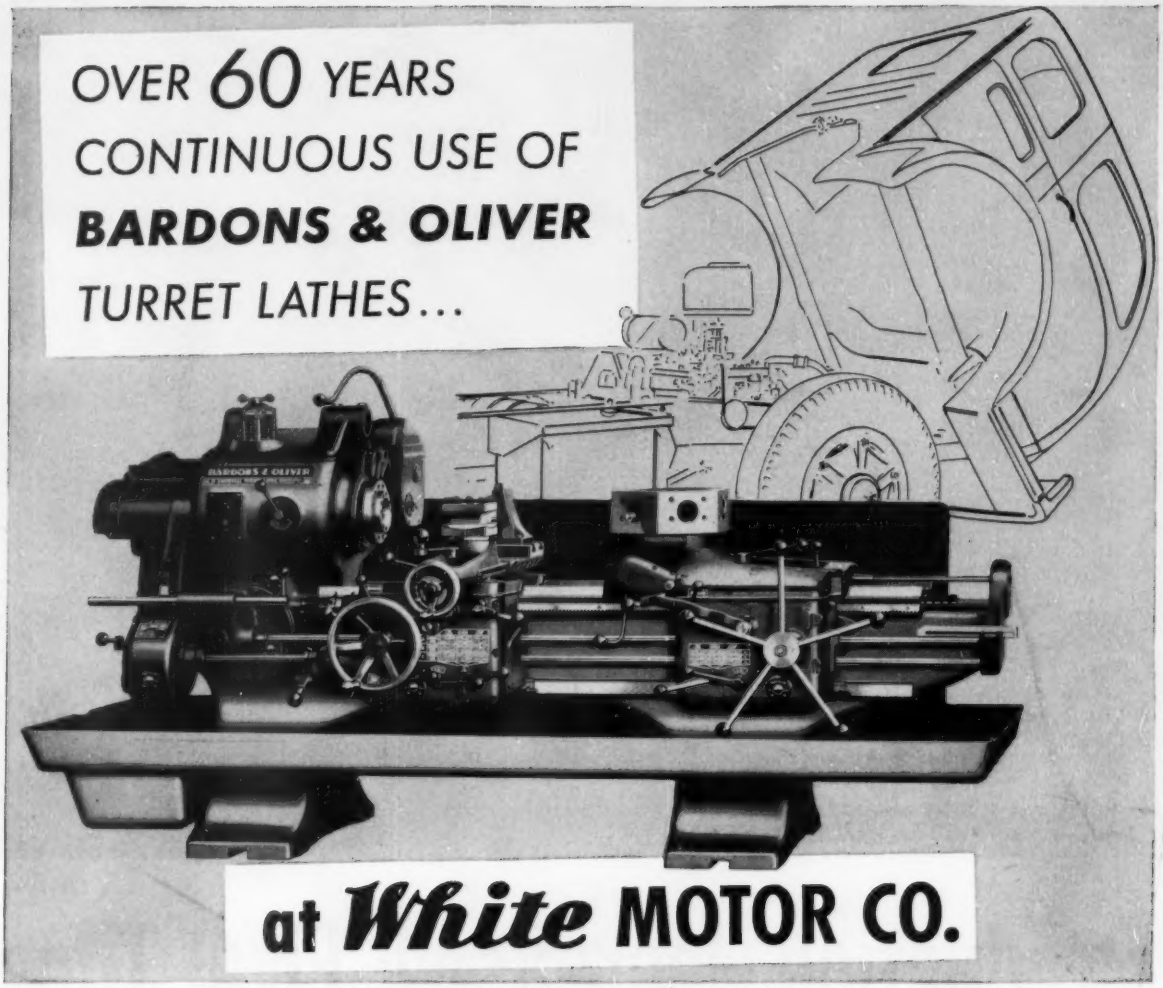
Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

OVER 60 YEARS
CONTINUOUS USE OF
BARDONS & OLIVER
TURRET LATHES...



at *White* MOTOR CO.

Good machine tools are essential to production of quality automotive products. For over 60 years White Motor Co. has been a continuous user of Bardons & Oliver Turret Lathes in the production of their famous trucks—so well known for their ruggedness and long life. Last year White Motor ordered an additional five Bardons & Oliver Turret Lathes.

These repeat orders are the best evidence of the quality, performance and cost reduction that the users of Bardons & Oliver Turret Lathes enjoy.

Let us show you how Bardons & Oliver Turret Lathes can contribute to the quality and cost reduction of your product. Available in seven sizes . . . all outstanding for maximum production.

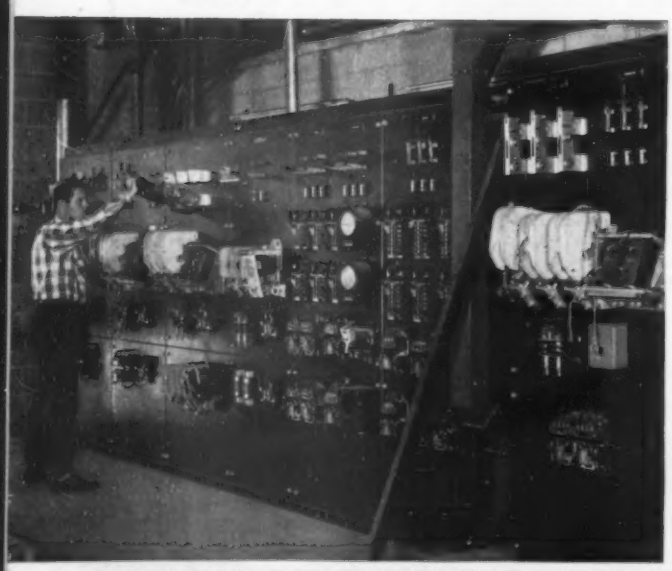
MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING OFF LATHES

BARDONS & OLIVER, INC.

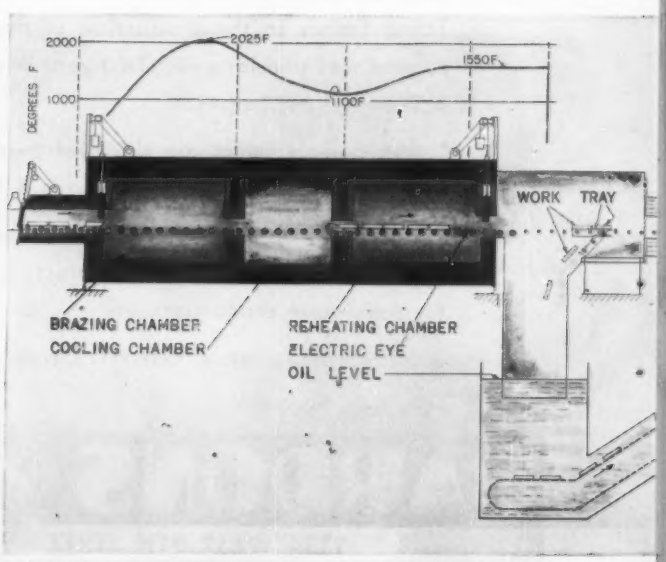
1134 WEST 9TH STREET • CLEVELAND 13, OHIO

MANY OPERATIONS—including preheating, annealing, brazing, hardening, and tempering, with intermediate cooling and quenching—can be combined in one continuous pass through this type of combination G-E furnace. All intermediate handling is eliminated.

Production Increased Five Times



AUTOMATIC CONTROL AND TIMING of the complete heating cycle is provided by this G-E control panel. After heating pattern is set, panel supervision is not necessary, and uniform, high-quality heat treatment of parts is assured.



LONGITUDINAL SECTION VIEW of G-E roller-hearth furnace shows how assemblies pass through furnace during heat treatment. Straight-line heat treating like this simplifies furnace operation, and provides fast production and low handling costs.

with G-E "Combination" Furnaces

Burgess-Norton Combines Brazing And Hardening In One Furnace

"By combining brazing and heat treating of tank-track links in G-E roller-hearth, combination-type furnaces, we increased the production per furnace five times without adding any new personnel," reports Burgess-Norton Mfg. Co., Geneva, Ill.

In addition, this former user of batch-type, box furnaces has improved product quality, conserved production floor space, and substantially reduced costs by eliminating many handling operations.

Automatic operation of this G-E furnace reduces handling to merely loading and unloading the assemblies. No intermediate handling of work between brazing and heat treating is required because parts are brazed, partially cooled, reheated, and quenched for hardening in one continuous pass through the furnace.

Improved product quality and fewer rejects are assured because electric furnaces provide uniform heating of every part. Product inspection time is reduced because low-cost, G-E protective atmospheres prevent scaling. Parts emerge from the furnace bright and shiny requiring only a fast, visual examination.

You can reduce your over-all heating costs with these "combination" furnaces designed to meet the needs of a wide variety of metal-processing operations, including preheating, annealing, brazing, hardening, normalizing, or tempering. For more information, contact your nearest G-E Apparatus Sales representative.

GENERAL ELECTRIC

WRITE NOW FOR THESE MODERN METAL PROCESSING BULLETINS

• Furnace and Induction Brazing, GEA-5889 • Annealing Malleable Iron, GEA-5797 • Heat-treating Aluminum, GEA-5912

Address: General Electric Co., Sect. 720-119, Schenectady 5, N. Y.

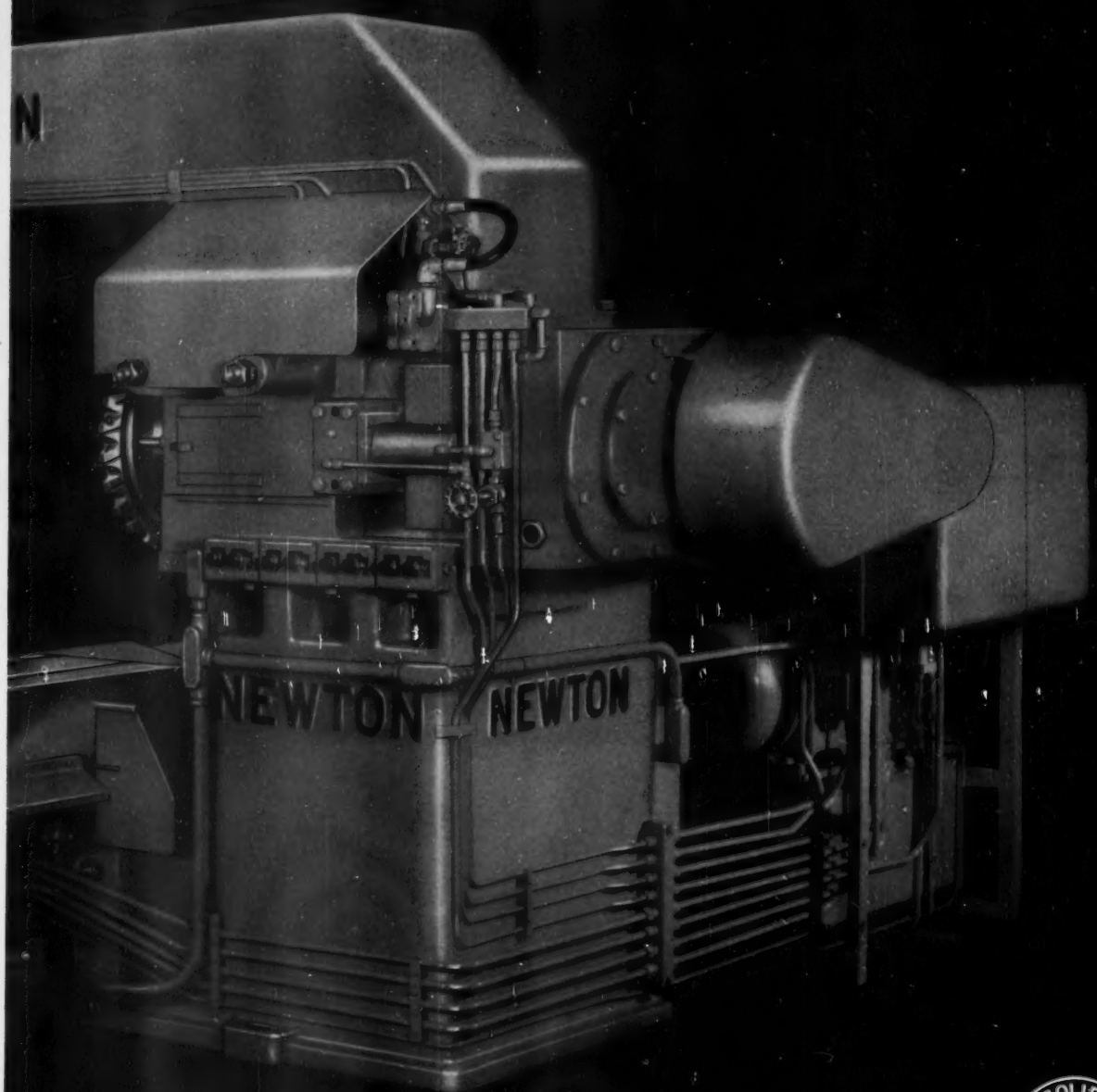
. . . as good

Newton M-59 Duplex Unit-Head Milling Machine with hydraulic spindle retraction and clamping that *accomplish stock removal and high quality finish in one pass!*

CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

as it looks!



CONSOLIDATED MACHINE TOOLS

CORPORATION, ROCHESTER, N. Y.

Birmingham Company, Incorporated

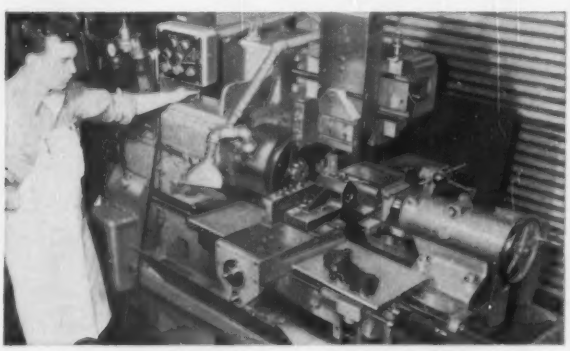
STOP LOSING TIME ON TURNING JOBS LIKE THESE

Sundstrand Automatic Lathes Increase Production on *Both* Small Lot and Long Run Turning

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only three of the many users of this modern equipment. All of the advantages of multiple-tool turning are available on small lot, long run and special turning. Study these brief examples and compare the production figures with parts similar to yours . . . then get the whole story for equivalent or better savings on turning work in your own plant.

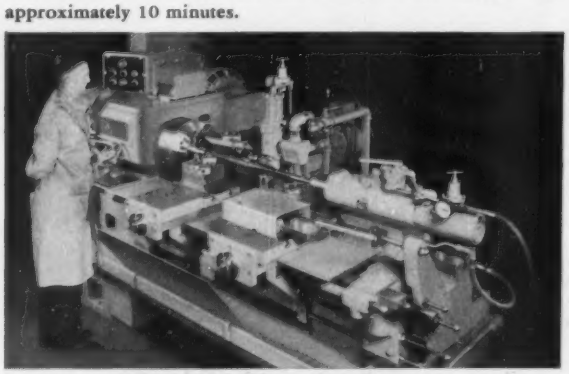
Long Run Turning

This Sundstrand Model 8A Automatic Lathe turns and chamfers three different lengths and diameters of master track link pins. Operator loads parts into a hopper loader and automatic machine cycle is started with chucking of part. When machine cycle is completed and the front slide has returned to the starting position, a work ejector pushes the pins out of the chuck and into the unloading vee. Machine will run automatically with one filling of the hopper for approximately 10 minutes.



Small Lot Turning

Pump rotors and covers, in lot sizes of 100 to 500 parts, are turned on this Sundstrand Model 8A Automatic Lathe. Previously these parts were turned on 3 conventional turning machines using 3 operators. Production with this one Sundstrand was increased 2½ times. Operations include facing, turning and core drilling. Production on cast-iron parts is 120 per hour.



Special Turning

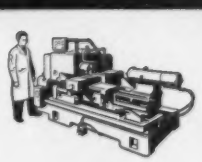
Automobile, truck and service axle shafts are turned, faced and chamfered on this Sundstrand Automatic Lathe. It has two front carriages, with a special cam bar for one, and a rear cross slide. A steady rest holds the part for rigid machining. The flange, bearing diameter and spline end are machined in one automatic cycle at the rate of 32 shafts per hour.

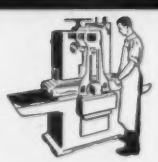
SUNDSTRAND

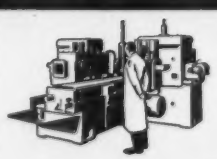
*"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







DESIGN FEATURES THAT MAKE THIS PRODUCTION POSSIBLE

- Greater Horsepower
- Wider Speed Range
- Wider Feed Range
- Greater Carriage Adjustment
- Faster Set-Up
- Quick Cycle Changeover
- Automatic De-Clutching
- Screw Feed to Front Carriage

5 Models Cover HP Range of 3 to 75 HP

	4A	6A	8A	12A	16A
Spindle Motor, hp.	3 to 10	10 to 15	10 to 25	20 to 50	50 to 75
Speed Range (in 2 models)	60 to 3600	60 to 1800	40 to 1800	30 to 1200	20 to 600 (1 model only)
Feed Range, in/rev.	.003 to .048	.004 to .067	.004 to .070	.004 to .070	.0025 to .100
Front Carriage: Longitudinal feed, max., in. (with straight feed-in)	5-1/4	3-1/2	4	5	8
Swing over cross slide, max., in.	9-1/2	12-1/4	12-1/2	15-1/4	17
Rapid traverse rate, in/min.	300	250	250	250	250
Rear Slide: (Max. stroke), in.	4	4-3/4	5-1/2	6-1/2	8
Lengths between Centers, in.	15, 24, 36	18, 24, 36	24, 36, 48	24, 36, 48, 60	36, 60, 84

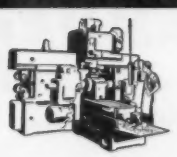
Let Sundstrand Engineers Help You Select the Proper Automatic Lathe to Suit Your Work

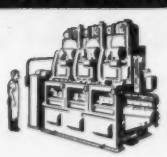
Let our engineers assist in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of *both* short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.

Free Additional Data

Complete information on Sundstrand Automatic Lathes can be obtained from these booklets. Ask for bulletin 140.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

CUTTING. New S.E.C.O. keeps parts and tools cooler. Tools last longer, require fewer grindings; production is increased; finishes are uniformly good.

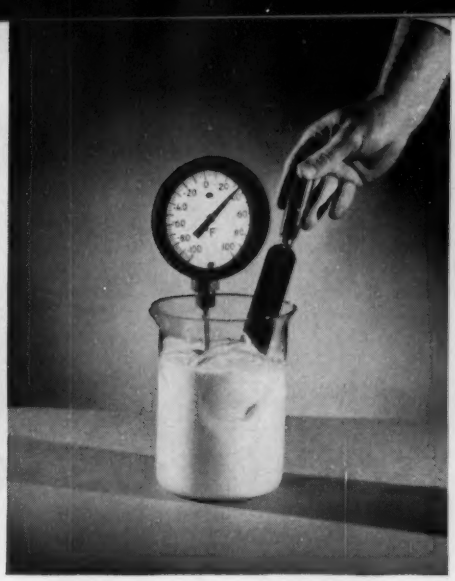
Now Better Than Ever!

Sunoco Emulsifying Cutting Oil

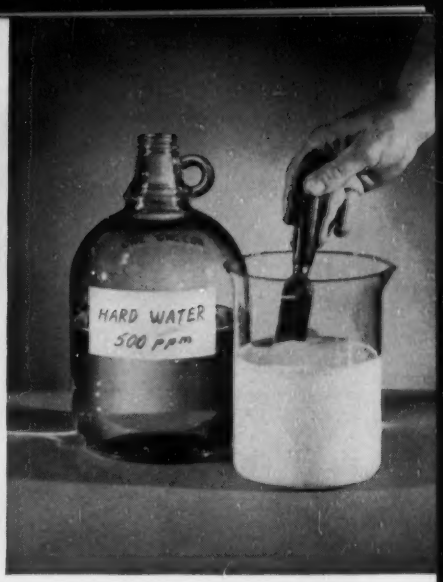
New refining facilities improve industry's most widely used cutting oil and permit it to give these added benefits

- **HIGHER MACHINING EFFICIENCY**—better finishes, longer tool life, increased production in cutting operations
- **INCREASED DETERGENCY**—particularly important in grinding operations—provides better surface finishes, prevents loading and glazing of the wheel, prolongs wheel life
- **BETTER MIXING QUALITIES**—in hot, cold or hard water
- **A PURER, CLEANER CUTTING OIL**—whiter, more stable emulsions; cleaner parts and machines; better operator acceptance
- **EASIER HANDLING**—pumps from storage tanks more readily, flows from drums faster
- **GREATER VERSATILITY**—can be used for rolling, washing and rustproofing as well as cutting and grinding

MIXES BETTER IN HOT WATER. New S.E.C.O. mixes and remains stable even at 180 F. This permits its use in washing and rustproofing.



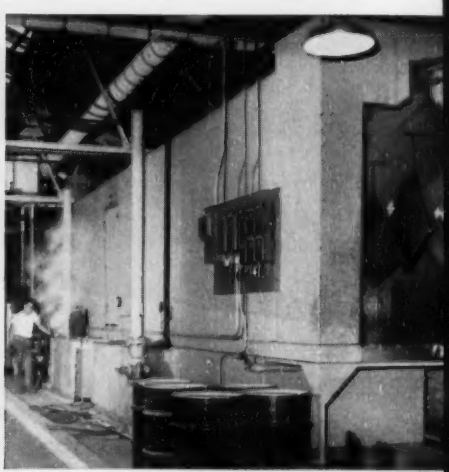
MIXES EASILY IN COLD WATER. New S.E.C.O. forms stable emulsions in the coldest water . . . even ice water does not affect it.



MIXES READILY IN HARD WATER. New S.E.C.O. eliminates the need for special hard-water grades of emulsifying cutting oil.

GRINDING. New S.E.C.O. improves surface finishes because its increased detergency prevents loading and glazing of grinding wheels, prolongs wheel life.

RUSTPROOFING. New S.E.C.O. is a better hot rustproofing medium. It forms stable emulsions, coats metal parts uniformly, protects them against rusting.



WASHING. Because of its increased detergency and its ability to mix and remain stable in hot water, New S.E.C.O. is better for removing grease and dirt from metals.

TEST THIS NEW S.E.C.O. IN YOUR OWN PLANT. For more information, call your nearest Sun office or write SUN OIL COMPANY, Phila. 3, Pa., Dept. AM-2.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Made by the producers of famous Blue Sunoco Gasoline and Dynalube Motor Oils

All the grades of U·S·S Stainless Steel are available to you again

we'll be happy to help you use them properly

● With the recent lifting of controls on nickel, the line of U·S·S Stainless Steel is complete again. In the nickel-bearing and straight-chromium grades, you'll find a Stainless Steel for almost every purpose . . . a Stainless Steel well suited to almost every type of fabricating operation.

The broad range of Stainless grades now available may give rise to questions in selection, for these grades differ widely in composition and in heat and corrosion resistance.

We'll be glad to help you in this respect. Our book, "Fabrication of U·S·S Stainless and Heat Resisting Steels," lays down the ground rules. It discusses the several types of U·S·S Stainless Steels from the standpoint of the various operations encountered in normal fabricating procedure. You'll find a copy helpful, we are sure.

But such a book cannot answer every specific question. In some cases you'll want to talk to one of our representatives. After he is fully informed on your product and the fabricating procedures you use, he'll be able to recommend the most suitable grade of U·S·S Stainless Steel. Or, he may even suggest slight modifications in fabricating procedure that would give you better performance and greater economy.

If you would like a copy of our "Fabrication" book, write to United States Steel Corporation, Room 4280, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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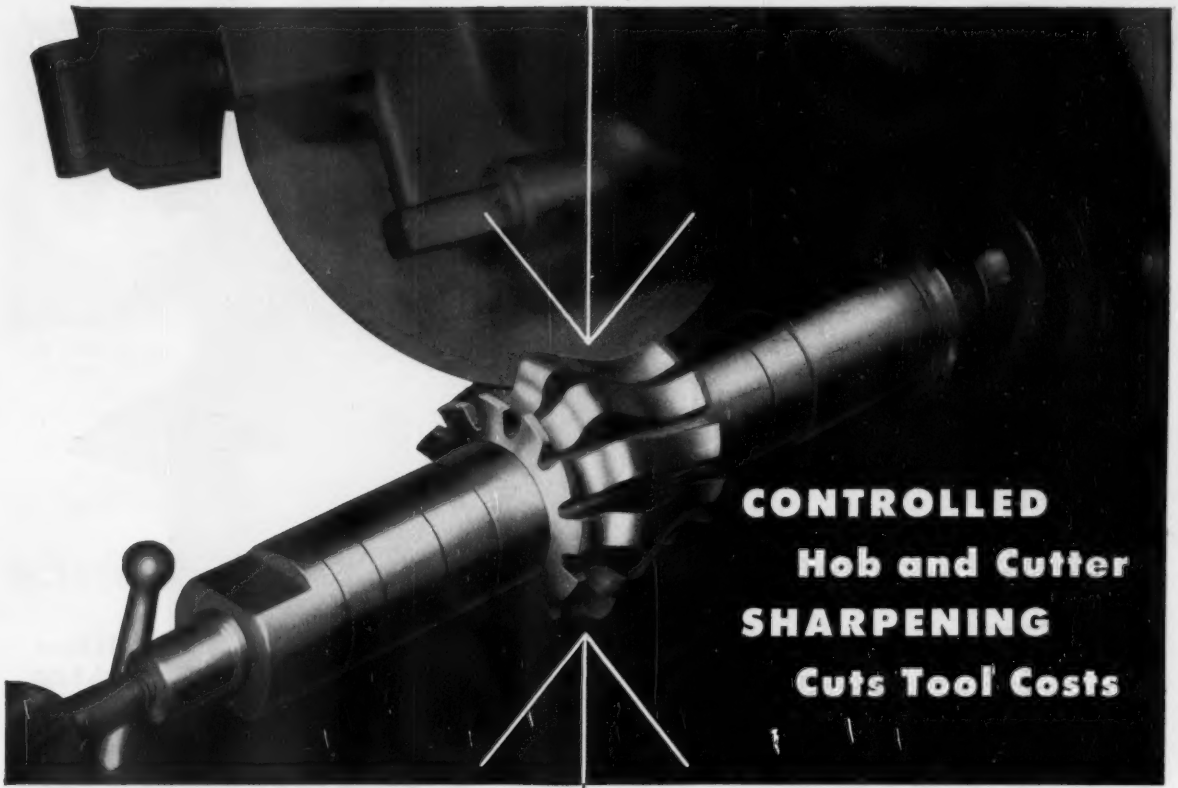
U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

4-451

UNITED STATES STEEL



CONTROLLED Hob and Cutter SHARPENING Cuts Tool Costs

Barber-Colman Sharpening Machines offer a selection of production sharpening equipment for precision control of:

Tooth Spacing
True Radial or Rake Teeth
Straight or Helical Flutes
Carbide-Tooth Sharpening

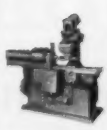
Assure maximum tool performance and maintenance of original tool accuracy by sharpening hobs and form-relieved cutters on Barber-Colman Automatic Sharpening Machines.

Tools sharpened to the established tolerances last longer and cut better.

Ask your Barber-Colman representative for complete information or write direct listing the range of your sharpening requirements.

No. 6-5

No. 4-4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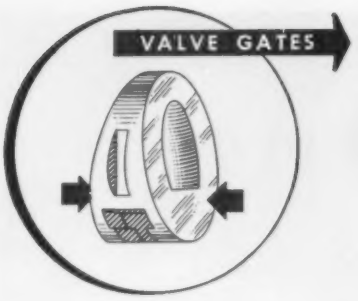
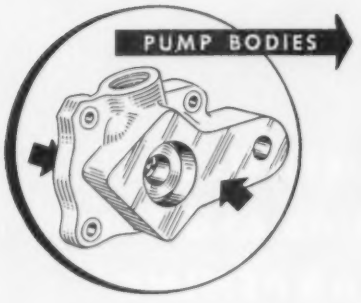
No. HRS

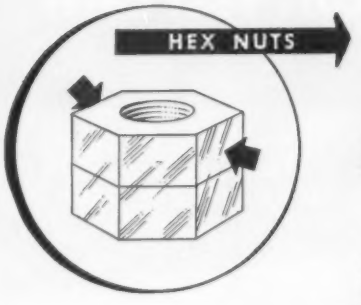
BARBER COLMAN

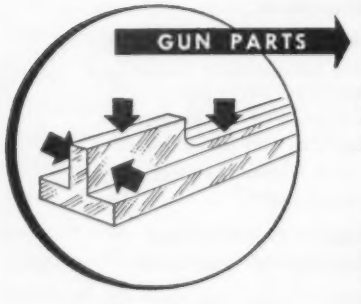
Barber-Colman Company

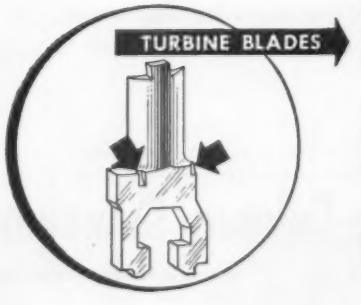
GENERAL OFFICES AND PLANT, 612 ROCK STREET, ROCKFORD, ILLINOIS

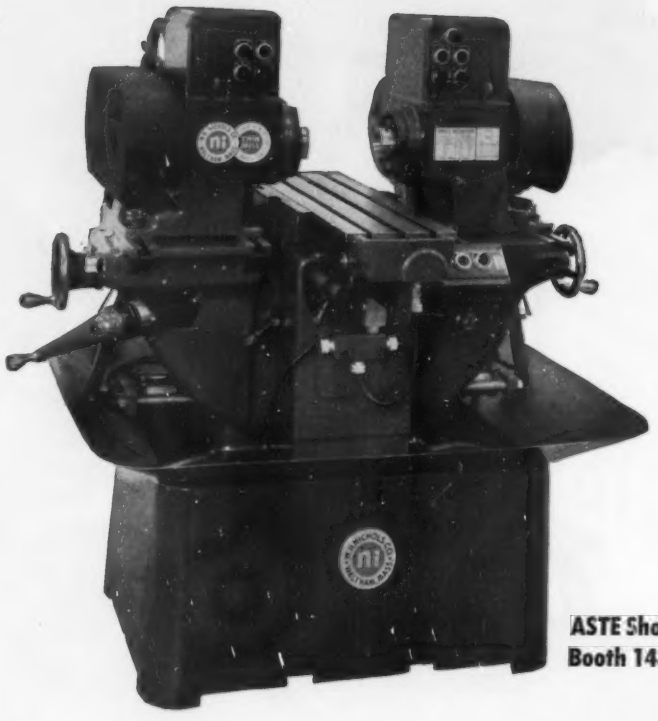












ASTE Show
Booth 1431

on the NEW *Nichols* TWIN MILL

The TWIN MILL cuts milling costs in half on many jobs. It handles **TWO** milling operations at a time, yet requires but **ONE** fixture and **ONE** operator. Designed for the class of work usually assigned to Hand Millers or light Automatic Production Millers, the Twin Mill's speed, accuracy, and exceptional flexibility add up to increased output at lower cost. **New** Spindle Retraction automatically withdraws cutters at the end of each cutting stroke. **New** Spindle Brakes act instantly after cycle is completed. The Two Milling Heads are independent units with individual motor drives, quickly adjusted UP or DOWN, IN or OUT, or OFF-SET longitudinally. Machine handles short run or long run work economically. Automatic table cycle and entire machine push-button controlled. Write for details.

CONDENSED SPECIFICATIONS

Table, working surface	8⅝"x 30"
Table, travel—cutting stroke	11¾"
Motors	(two) 1 HP
Maximum height center of spindle above table	11¾"
Maximum offset of spindles (horizontal)	8½"
Maximum distance between spindle noses (across table)	16"
Floor space required	64"x56"
Spindle Speeds (15)	from 55 to 2050 R.P.M.

Manufactured by W. H. Nichols Co., 48-U Woerd Ave., Waltham 54, Mass.

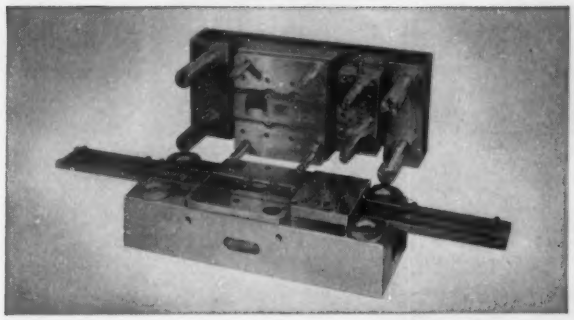
Have you seen the new Nichols' movie, "The Miller That Uses Its Head"? It's available for showing in your plant.

Also available are NICHOLS Hand Millers, NICHOLS two-spindle millers with identical or opposed spindles, and with or without pneumatic feed.

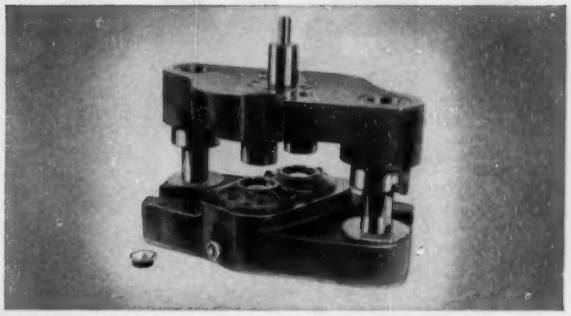
Please address inquiries to

NICHOLS-MORRIS CORPORATION 76-F MAMARONECK AVE. WHITE PLAINS, N. Y.

Dealers in Principal Cities



1 Lamination die, made for Schick, Inc., produces rotor and stator laminations of motor-grade silicon steel. Customer reports carbide die produces average runs 35 times as long as steel dies.



2 Blanking and drawing of screw bottle caps is done by this die for Armstrong Cork Company, Lancaster, Pa. Die operated accurately on material .006" thick for months. Steel die had to be changed each week.

Case histories show how dies reduce costs when equipped with Carboloy® cemented carbide

3 Simple pierce and cutoff die, designed for Electric Auto-Lite Co., Toledo, operates at speeds faster than 400 strokes per minute. Die has produced over 2,000,000 strokes . . . and still does not require sharpening.

Actual plant performance has proved how easy and profitable it is to use Carboloy cemented carbide over a wide range of applications. For blanking, forming, drawing and piercing . . . for large or small, simple or complex dies . . . only carbides will give you benefits like these:

- **Production runs 35 times greater than steel (see picture No. 1)**
- **Accurate tolerances held for months . . . as compared to days with steel (see picture No. 2)**
- **Over two million high-speed strokes . . . without needing resharpening (see picture No. 3)**

If you wish, a member of the Carboloy Engineering Appraisal Service will call at your plant, without obligation. He'll show you how simple it is to wear-proof your dies; how to get increased production with fewer rejects. And you can send your key personnel to the Carboloy Die School in Detroit.

Also free is the Carboloy Die Engineering Manual D-124. It shows you how easy it is to design, apply and maintain carbide dies. For any of these free, cost-reducing Carboloy services or literature, send coupon below.

FILL OUT THIS COUPON—MAIL IT TODAY!

CARBOLOY Department of General Electric Company
11149 E. 8 Mile Ave., Detroit 32, Michigan

- ☐ Rush me free Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on free Carboloy Die Training School.
- ☐ Have a representative of the Carboloy Engineering Appraisal Service call at my plant, at no obligation to me.

Name_____ Title_____

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CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

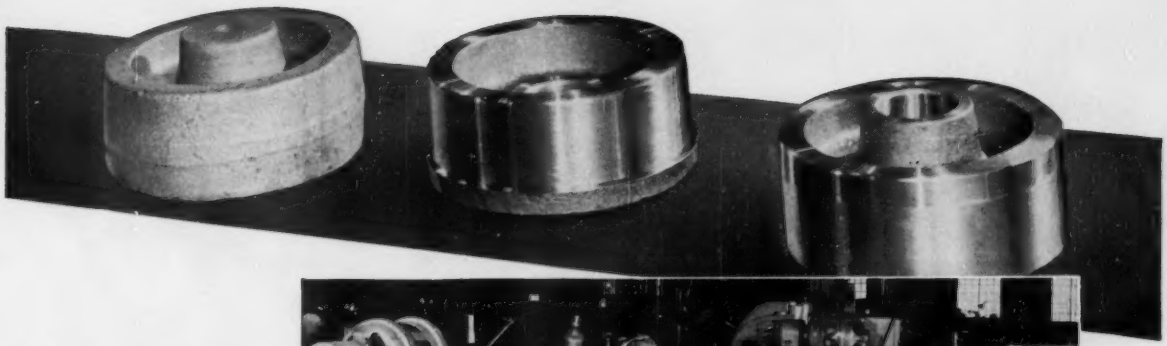
Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the newer additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

ARMSTRONG BROS. TOOL CO.

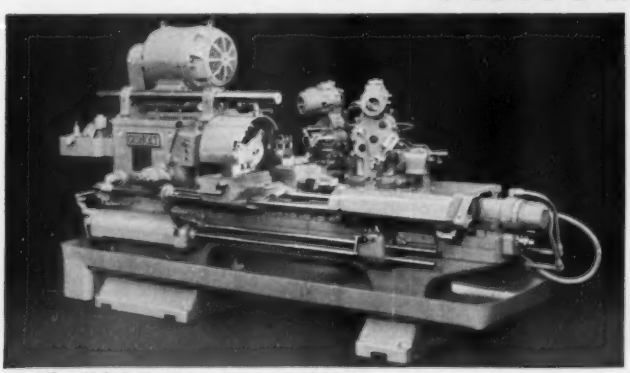
"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**



from 41.9 Minutes down to 15 Minutes

That's Productivity with the GISHOLT FASTERMATIC



The Gisholt Fastermatics are built in three sizes ranging from 21" to 36½" swing over bed.

The cost of machining these gear blanks at the Falk Corp. took a sharp drop when the Fastermatics took over. Time was cut nearly two-thirds. Moreover, human errors were eliminated, thanks to Fastermatic's ability to hold close tolerances.

One operator tends 2 Fastermatics and a honing machine. Simple tooling makes it possible to handle 9 different sizes of gear blanks.

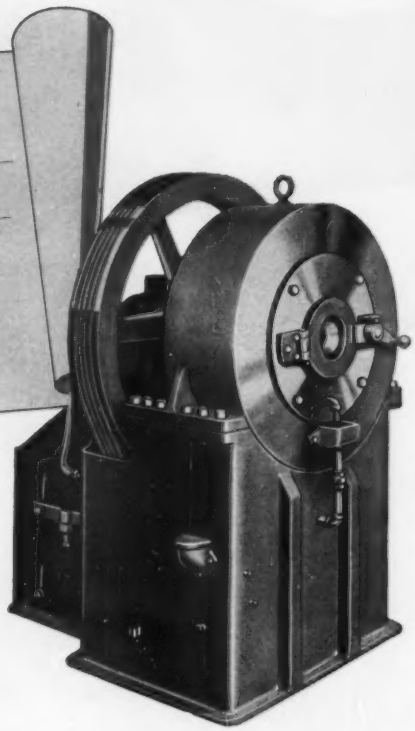
These modern automatic turret lathes enable you to handle a larger number of operations in one chucking—and cut costs to the bone on a wide variety of work. Ask for facts about them.

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

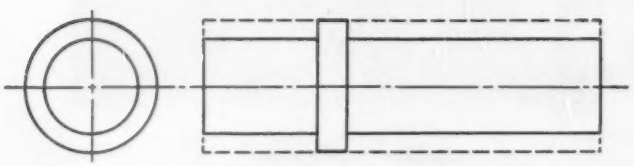
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Swaging Success Stories

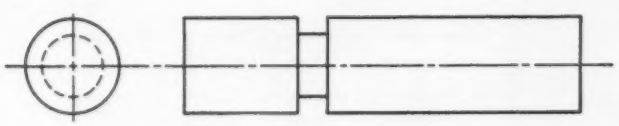


Quicker, Better, Cheaper

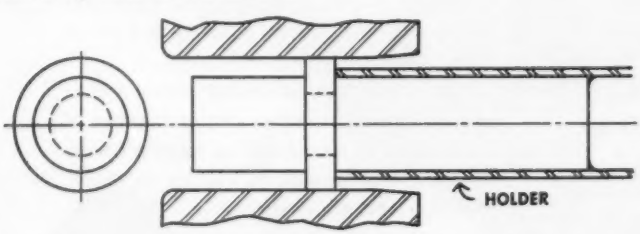


This part was originally turned on a special machine to produce the desired collar or spring seat. The dotted lines indicate wasted, excess material.

Then this manufacturer investigated swaging. Look at the results:



A blank rod with the same diameter as the turned piece was grooved. This provided the location for a ring to be positioned by means of a holder.



Then the ring was swaged firmly into place. Final results—the same as the expensive screw machine piece.

Can You Use Savings Like These?

1. Savings in material—swaging here uses nearly all the metal.

2. Savings in labor—swaging can be done by unskilled hands.

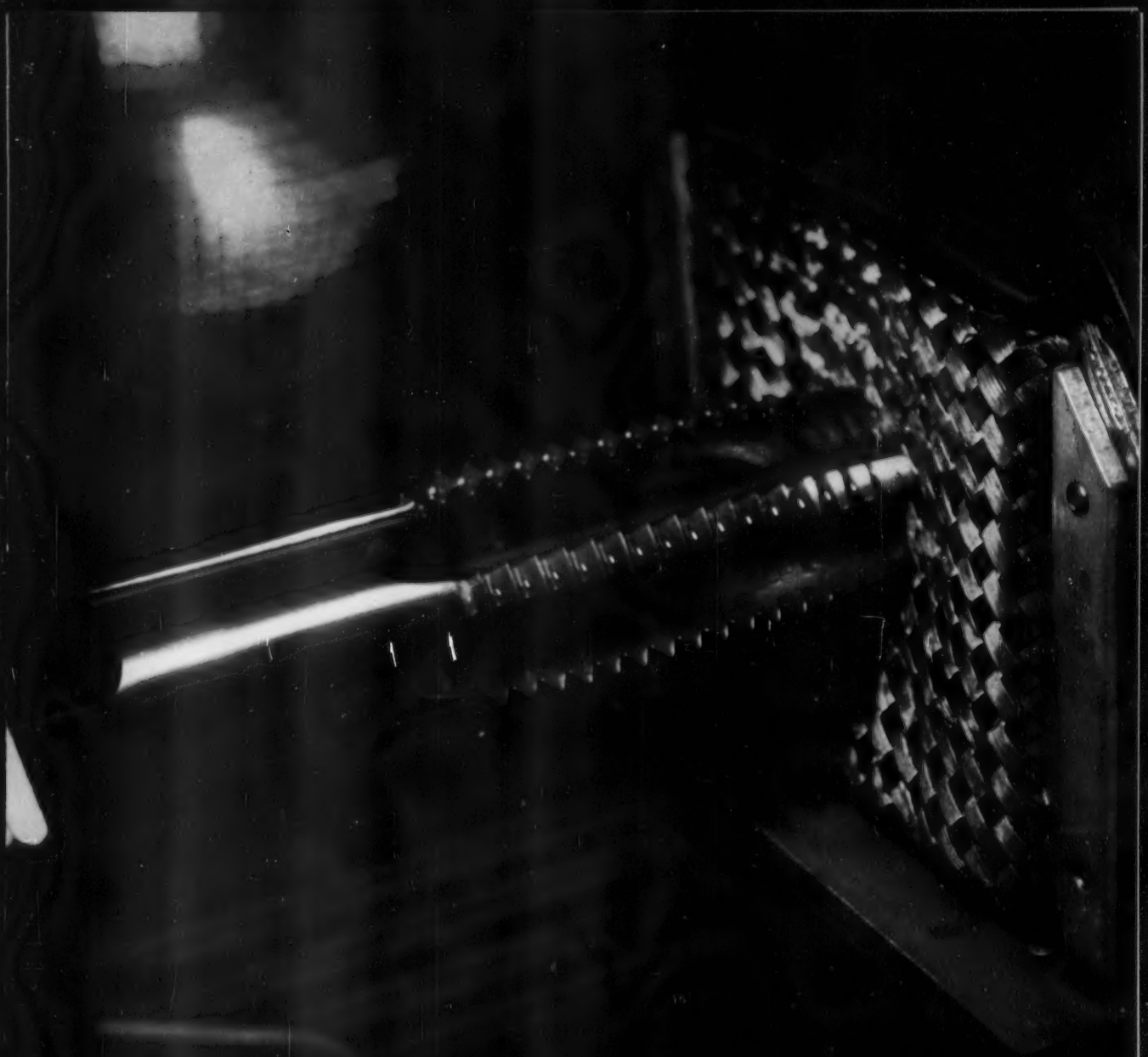
3. Increased output—swaging is fast.

4. Improved products—swaging toughens metal, gives it better resiliency, hardness, finish.

We'll be glad to send you an informative booklet on swaging that contains complete descriptions of Torrington Rotary Swagers. Ask for it today; it may save you money tomorrow.

THE TORRINGTON COMPANY
Swager Department
222 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES



Black Light and Tap Life

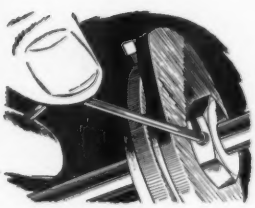
Black light enables our engineers and inspectors to literally "see in the dark". Focused on a magnetized tool flooded with a fluorescent solution, it permits the operator to *see* cracks or other surface imperfections not otherwise observable.

This equipment is just another safeguard in the research and quality control programs conducted at GREENFIELD, enabling us to make on-the-spot checks of the performance of new materials or new heat treating cycles, and to give 100% inspection *plus* of tools under test.

Greenfield TAP AND DIE CORPORATION, GREENFIELD, MASSACHUSETTS

UNBRAKO **Self-Locking Socket Set Screws** are used to hold the Vernier-Set or Cycle-Progress cam on the shaft of this precision timing device. Once they are tightened, they maintain the accurate setting so important to the operation of the instrument.

Because they are so tiny, the UNBRAKO set screws are picked up and started in the tapped hole with the long arm key.



The compactness of the design of the timing device makes it necessary to turn the screw in prior to assembly. The uniform depth and size of the hex socket permit maximum torquing, speed assembly.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; have knurled cup point for positive locking. Are available in standard sizes from #4 to 1".

You can lower your inventory by using UNBRAKO Standards—stocked by your distributor

You'll have less money tied up in inventory, you'll get personalized service, faster deliveries. In addition, you'll reduce assembly time and increase production with these precision industrial threaded fasteners. Write for UNBRAKO Standards—a complete listing of socket screw products made by SPS and stocked by your local distributor. STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

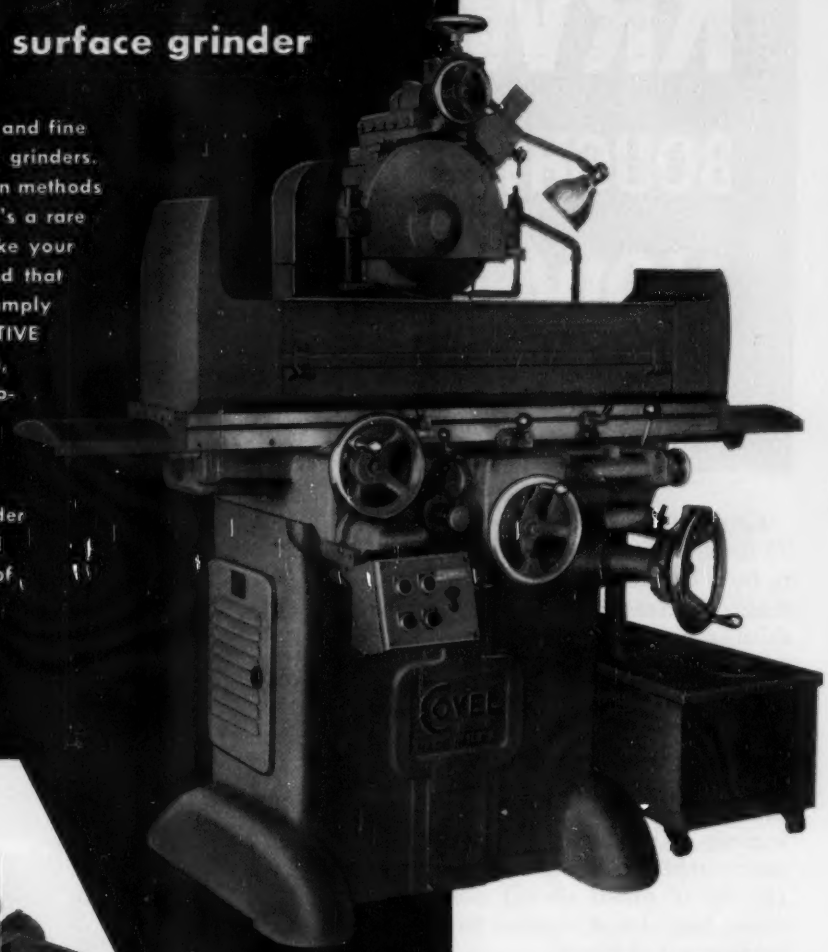
UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

WHAT COVEL'S 80 YEARS CAN MEAN TO *you*

when you select a surface grinder

It takes more than special features and fine materials to build the best surface grinders. Skilled workmanship, yes . . . modern methods and equipment, certainly. But there's a rare quality—a plus value that can make your grinder investment extra sound and that quality is yours with Covel . . . It's simply this: EIGHTY YEARS OF CUMULATIVE EXPERIENCE—of constant progress, keeping pace through four war production periods and through many business peaks and valleys.

So, when you select a Surface Grinder —or a Cutter and Tool Grinder, call on Covel and draw on this wealth of practical, productive experience. Send for data.



SURFACE GRINDERS
HYDRAULIC FEED:
14"x24"; 8"x24"; 6"x18"
HAND FEED: 6" x 18"

Send for
Bulletin A-34

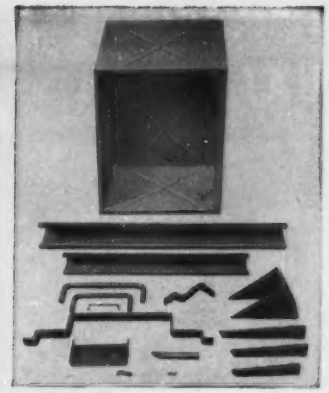
UNIVERSAL
CUTTER and TOOL GRINDERS
10"x30"; 10"x24"; 8"x16"

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

KRW PRESS
BOUGHT FOR ONE JOB
NOW DOES 15!

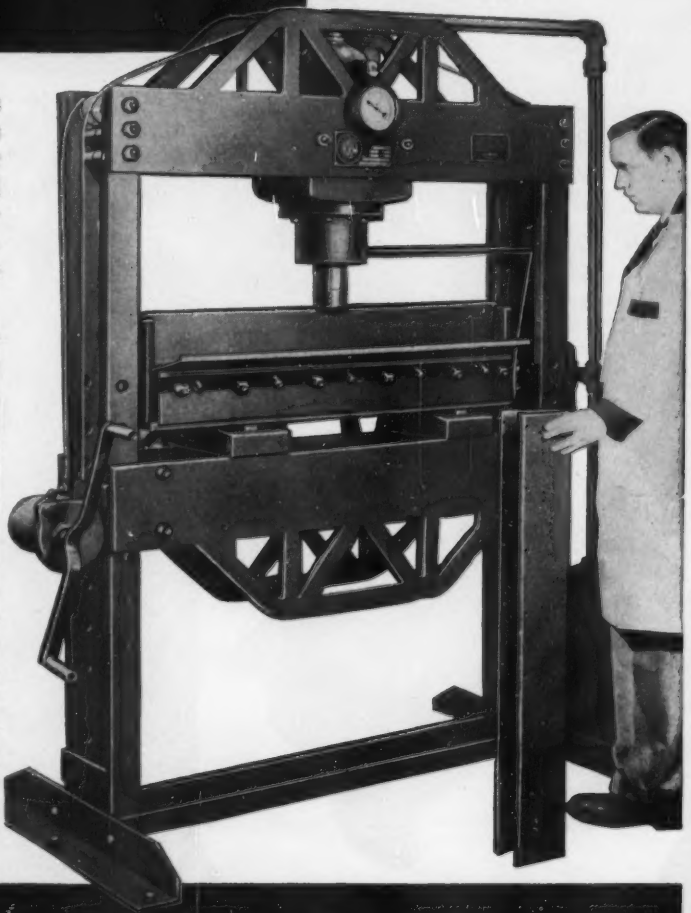


Here's the line-up . . .

Gross Machinery Inc. of Buffalo, N. Y., makers of dry cleaning equipment, forms all these parts on their KRW Hydraulic press. Each one used to be a slow, inaccurate hand or power brake job.

Gross Machinery originally bought this 75 ton KRW motor driven hydraulic press to form cylinder ribs of 14 gauge steel for their dry cleaning tumblers (second and third from top in photo above). Formerly made by hand, each rib required 12 minutes to form. Now the press does the *same job in* $1\frac{1}{2}$ *minutes.*

But that was only the beginning. The press soon began poking its nose into every problem in the plant. It gave them a 50% increase in production of filter plates for their tumblers. The lint-collecting drawer (at top in photo above) used to rattle. Gross had almost decided to make these drawers out of heavier gauge, more expensive steel. But then they found that criss-cross ribs formed by their KRW press eliminated the trouble. Brackets for the tumblers, corner inserts for the tumbler hoods, clips for holding wire and tubing on the tumbler — all these jobs are now made faster, more accurately on this versatile KRW press. Earl Westphal, general production superintendent at Gross, says: *"We bought this press late in* 1950 *and it's paid for itself ten times over."*



Bring your pressing problems to K. R. Wilson. We have a full line, 25 to 150 ton capacities, hand operated, air operated or motor driven presses. Write for facts, prices and delivery dates.

K. R. WILSON

210 MAIN STREET • BUFFALO 3, NEW YORK

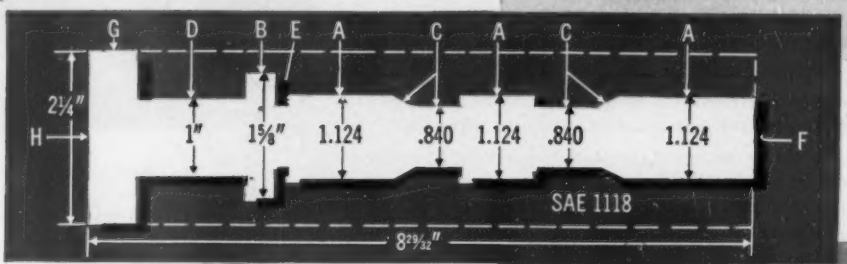
This is the difference High Velocity Turning makes

IN 1947 this job took...

11.50 min.

FLOOR TO FLOOR

A. Turn — 694 RPM — .015" Feed
B. Turn — 489 RPM — .015" Feed
C. } Form — 119 RPM — .0025" Feed
D. }
E. Face, shoulder, neck, undercut, HSS
F. Face 243 RPM — .0035" Feed
G. Knurl
H. Cut off — 243 RPM — .0035" Feed



IN 1954 this same job takes...

5.00 min.

FLOOR TO FLOOR

A. Turn — 1000 RPM — .022" Feed
B. Turn — 1000 RPM — .022" Feed
C. } Form — 340 RPM — .0035" Feed
D. }
E. Face, shoulder, neck, undercut
F. Face 489 RPM — .0035" Feed
G. Knurl
H. Cut off — 489 RPM — .0035" Feed

J & L TURRET LATHES GIVE...

MORE Ease of Operation
MORE Power Transmission
MORE Rigidity
MORE Accurate Stops
MORE Efficient Lubrication
MORE Coolant on Cutting Tools
MORE Accurate Results

Turning out a job like this in 5 min. calls for a lathe with plenty of power and the beef to back it up . . . a lathe like the Jones & Lamson #7A Universal Turret Lathe, which is specially designed to meet today's demand for more production at lower unit costs.

Only with a lathe like this can your shop take full advantage of the quality, productivity and lower costs offered by High Velocity Turning.

This job is one of the many turned at high speeds on our production line. Come to Springfield and see for yourself. At any rate, send for catalogs #101-A and #102.

JONES & LAMSON

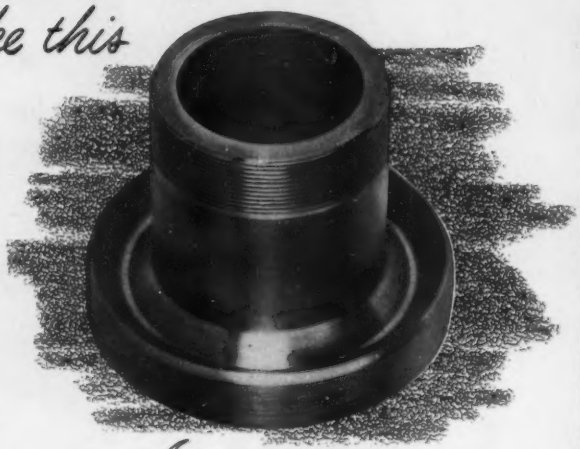
Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L MACHINE TOOL DIV.

automatic performance reduces costs

even on **SHORT RUN** *jobs like this*



A MOTOR MANUFACTURER who made this commutator sleeve, and similar components. in lots of 300 to 800 and in several sizes, said "*on a modern type, hand-operated turret lathe our net output varied from 2½ to 3 pieces per hour, depending upon conditions*".

Present output on his new Acme-Gridley Model M Single Spindle Automatic has more than doubled, as the job facts reveal. Much of this increase is due to Model M design features which avoid those so-called "conditions". Most important among these features is. . .

—fully automatic performance which guarantees a controlled cycle time and uniform precision—piece after piece

In other shops, these newest Acme-Gridley Single Spindle Bar Automatics, on hundreds of small and large lot jobs, are *2 to 10 times faster than the machines they replaced.* Ask for Catalog M-50A—better still, ask us to quote.

JOB FACTS:

Part: Commutator Sleeve
Size: 3⅜" dia. 2¾" long
Material: C-1030 Steel
Machine Time: on Acme-Gridley 3½" Model M Single Spindle Automatic—10½ minutes.
Operations: 11, including rough and finish trepan on O.D. of flange for smooth finish, reaming hole for close concentricity and threading with automatic Vers-o-tool to class 3 fit.
Former Time: on current model hand operated turret lathe—20 to 25 minutes.

Other Model M time and cost reducing advantages are—

- Eight independently operated tool slides and three automatic spindle speed ranges selective to suit each cut, whether for use of carbide or high speed tools.
- Turret indexes in 1 second and its independent tool slides provide for overlapping operations such as several short end cuts while the heavy cuts are continued from the side slides.
- The Model M also features standard cams, interchangeable spindle speed and feed change gears, and wide open tooling zone—all quickly accessible. So the set up time for changing jobs to secure fully automatic performance on similar work does not exceed that of the hand operated lathe.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.

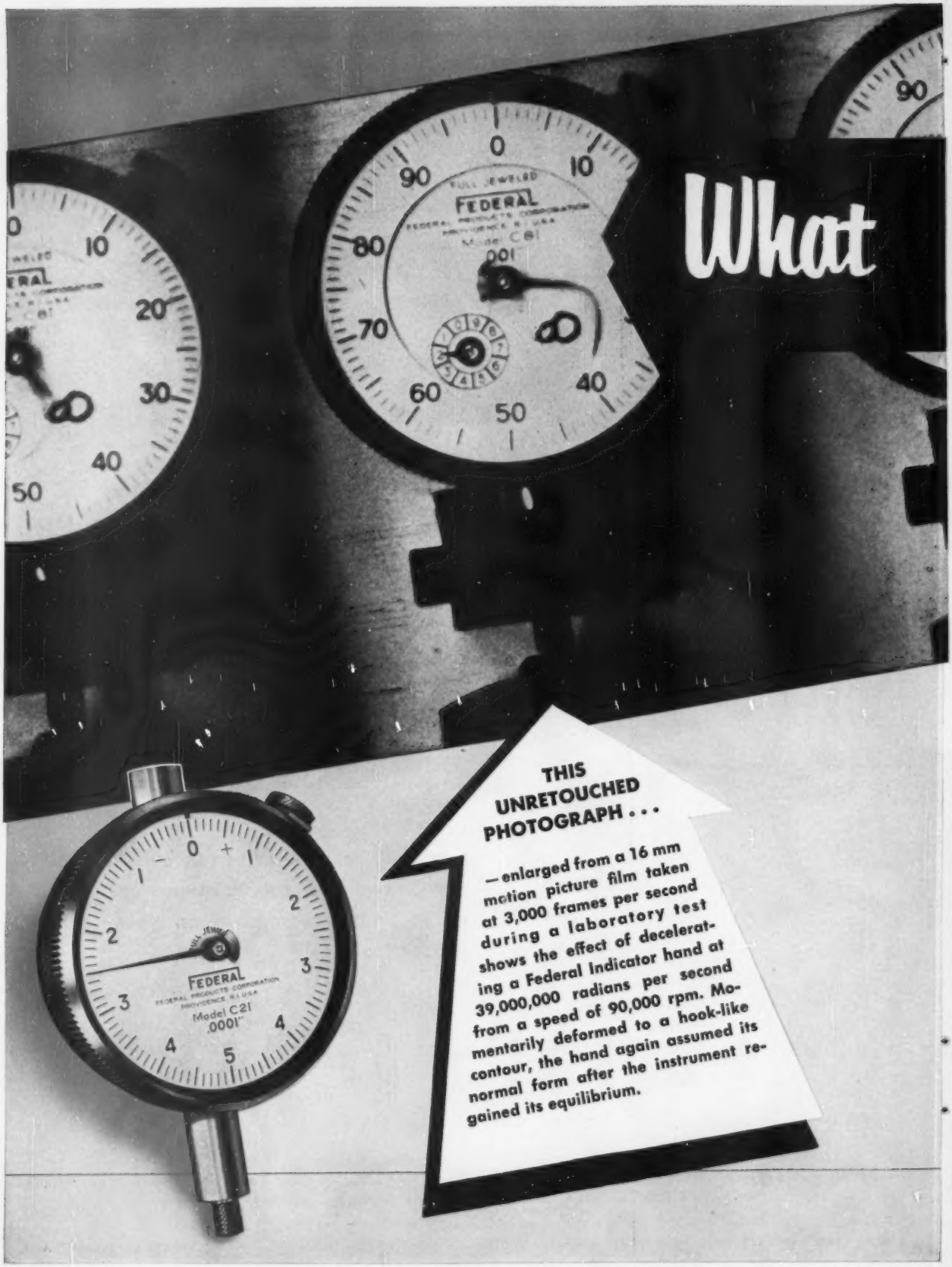
Card's 80 year record of concentration on one chief product shows up where it counts most — on your production line.

The CARD Quality

TAPS *by* CARD

Completely stocked offices at Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle
See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. **TAPS • DIES • SCREW PLATES**


What
FEDERAL
Model C81
.001
FEDERAL
FEDERAL PRODUCTS CORPORATION
PROVIDENCE R.I. U.S.A.
Model C21
.0001"
THIS UNRETOUCHED PHOTOGRAPH . . .
— enlarged from a 16 mm motion picture film taken at 3,000 frames per second during a laboratory test shows the effect of decelerating a Federal Indicator hand at 39,000,000 radians per second from a speed of 90,000 rpm. Momentarily deformed to a hook-like contour, the hand again assumed its normal form after the instrument regained its equilibrium.

this test means to YOU!

PROBABLY YOU'VE NEVER STOPPED TO THINK HOW IMPORTANT AN INDICATOR HAND CAN BE...

IT IS NOT JUST CONVENTIONAL MODERN DESIGN that makes the hand on a Federal Dial Indicator look as it does!

This high-speed movie shows one of thousands of tests made in our laboratory in a constant effort TO PRODUCE THE FINEST POSSIBLE DIAL INDICATORS FOR YOU. In this destructive test the hand has been momentarily deformed by an excessive blow on the Indicator's contact point.

You naturally ask why we don't just make a stiffer hand. The answer is that a *heavier* hand would increase the inertia and friction within the Indicator and decrease its sensitivity and accuracy. A *lighter* hand would have less inertia but it would not recover its normal straightness after extreme operating conditions. The hand of a Federal Dial Indicator MAINTAINS ITS NORMAL SHAPE.

Furthermore, the hand on a Federal Dial Indicator IS STATICALLY BALANCED to assure a CONSISTENT GAGING PRESSURE against the workpiece. You get a more sensitive Indicator of GREATER REPETITIVE ACCURACY.

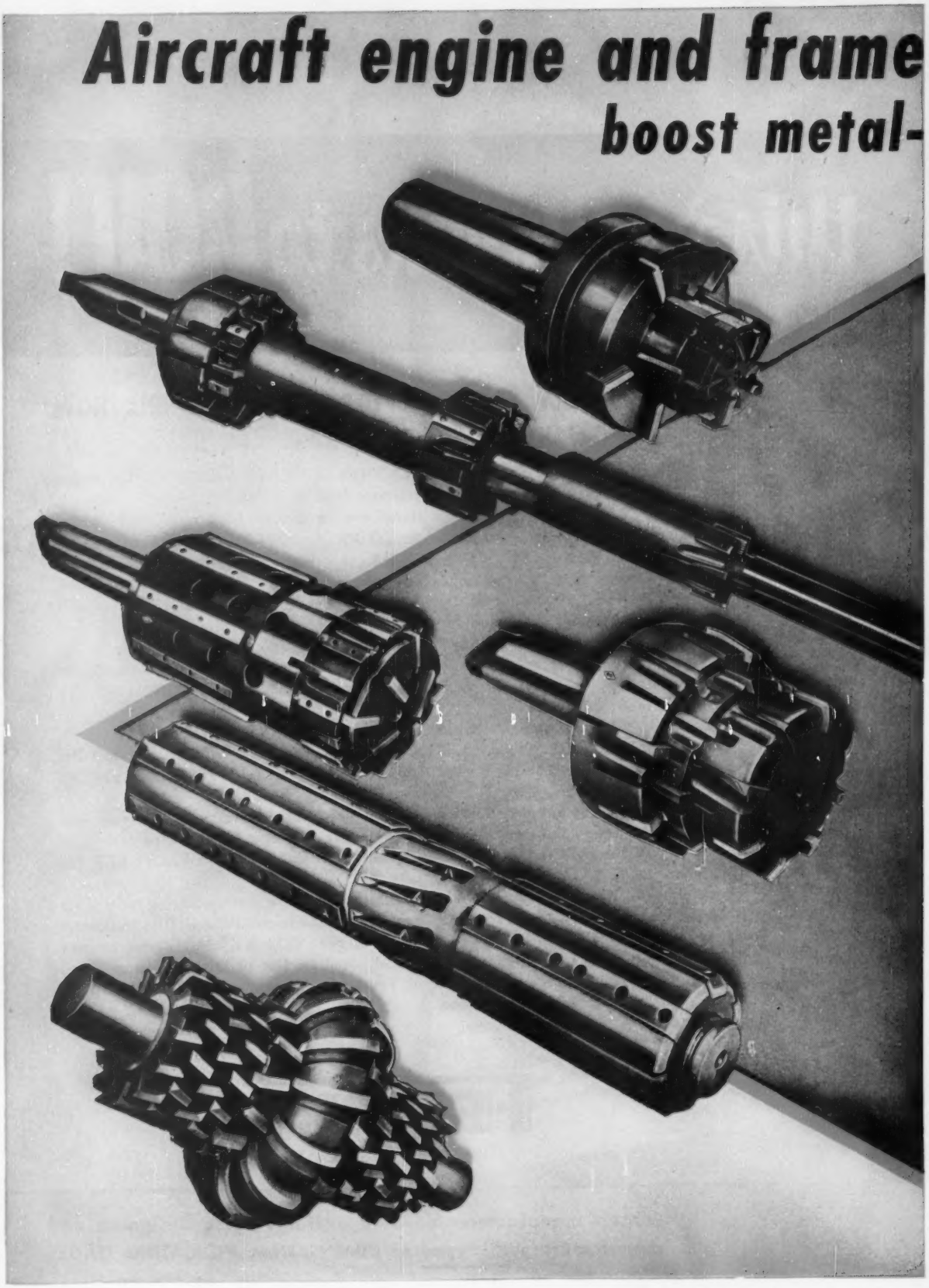
This kind of detailed research is typical of the great care that goes into the design and improvement of Federal Dial Indicators and helps to explain WHY FEDERAL IS THE WORLD'S LEADING MANUFACTURER OF DIAL INDICATORS.

It is also very much worth noting that modern manufacturing techniques and Modern Quality Control have enabled us to sell Federal Dial Indicators AT THE SAME LOW PRICE FOR FIFTEEN YEARS. If you haven't our latest catalog showing the most complete line of Dial Indicators of all styles and sizes, write Federal Products Corporation, 1122 Eddy Street, Providence 1, Rhode Island.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL *INDICATING* GAGES

Aircraft engine and frame boost metal-



manufacturers cutting operations with...

one-pass OK multiple diameter tools

Over fifty percent of O K tool orders from the aircraft industry are for combination cutters, designed to perform two, three and four operations with one pass of the tool. These tools take bulldog-bite rough cuts, or cobweb-thin, micro-finish cuts, with no restrictions as to metals, which run from stainless steel for jet-engine parts to heat-treated aluminum for cylinders and high-speed steel for triple-step lathe chuck jaws. Former production records are demolished! Where, yesterday, five pieces on the floor, was considered good; today, you find 50 pieces, inspected and passed.

TYPICAL MULTI-PURPOSE TOOLS

Designed from your blueprints or sample and specifications
COMBINATION BORING, REAMING AND CHAMFERING HEADS
BORING AND FACING MILLS FOR RADIAL DRILLING
PILOTED TREPANNING AND REAMING TOOLS FOR DEEP HOLE WORK
GANG CUTTERS FOR SLAB-MILLING
CHROME-MOLY PLATES FOR PROP BLADES

BUILT WITH MORE BEEF IN THE BODY

To better take the punishment of carbide milling, O K tools, by virtue of their simple, two-component design, are huskier in the body, size for size; thus permitting closer blade spacing for close tolerance work, and heavier blades for hogging jobs. Blades are wedge-shape* blocks. Blades, once seated and driven home, never budge. Mated serrations prevent lateral movement; provide an accurate adjustment to compensate for wear. Grinding is minimized to .005" per blade by fine-tooth features. Bodies are not weakened with cutouts for locks, screws, pins, gibs or gadgets. Of these, O K can nicely do without.

FREE CATALOGS

"Modern Milling Cutters for Modern Milling Machines"
"America's First System of Insert Single Point Tools"

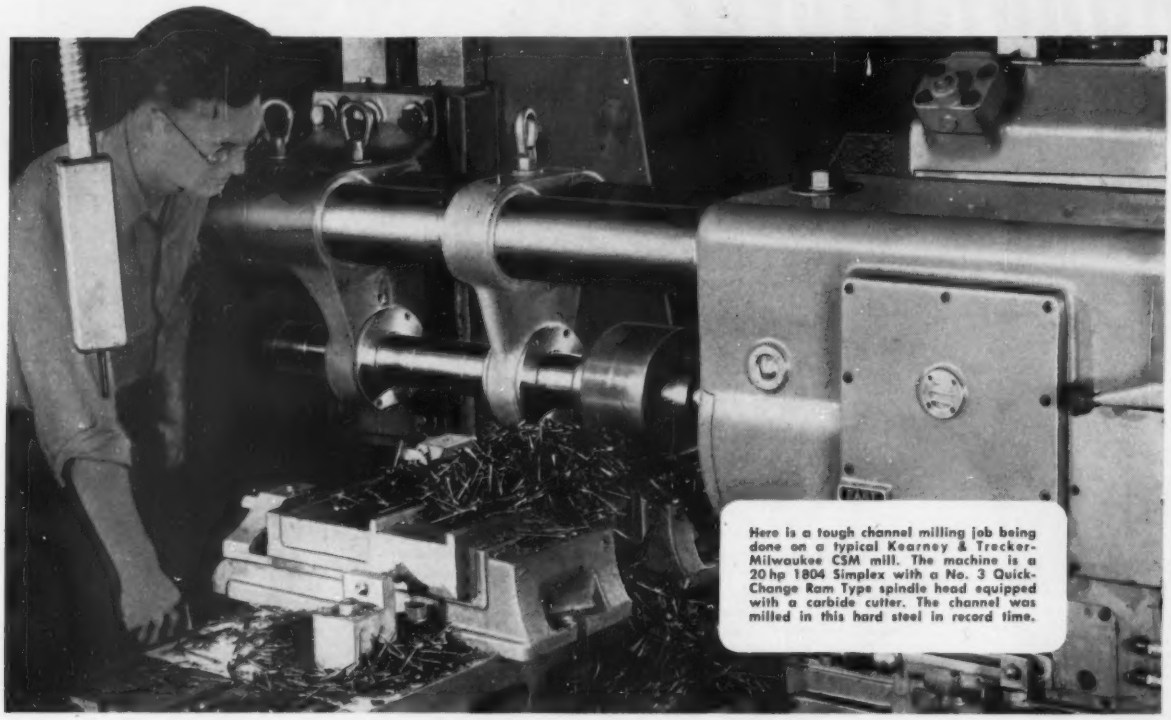
THE O K TOOL CO., INC.
Milford, New Hampshire

OK

modern milling cutters for modern milling machines

*The wedge is the world's strongest mechanical device

Put your milling on a profitable production basis



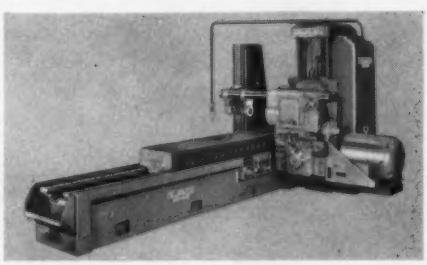
Here is a tough channel milling job being done on a typical Kearney & Trecker-Milwaukee CSM mill. The machine is a 20 hp 1804 Simplex with a No. 3 Quick-Change Ram Type spindle head equipped with a carbide cutter. The channel was milled in this hard steel in record time.

Choose a CSM BED TYPE production mill from over 400 available combinations!

FOR more efficient metalworking, investigate the most modern and useful line of bed-type milling machines ever designed. Custom-built from standard units, CSM machines are available in 10 to 50 hp, Simplex and Duplex models with a choice of quill type or ram type heads. Tables are available in four standard widths — 18, 24, 32 and 42″ — with travels from 4 to 12′. Rapid traverse rate is 150″ per min., and 32 feed rates range from ¼ to 60″ per min. You can choose from a wide range of attachments and accessories to meet your exact tooling needs.

Your Kearney & Trecker Special Machinery representative will be pleased to give you all the details . . . help analyze your machine tool requirements.

Capacity . . . Experience . . . Performance — In our just completed $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.

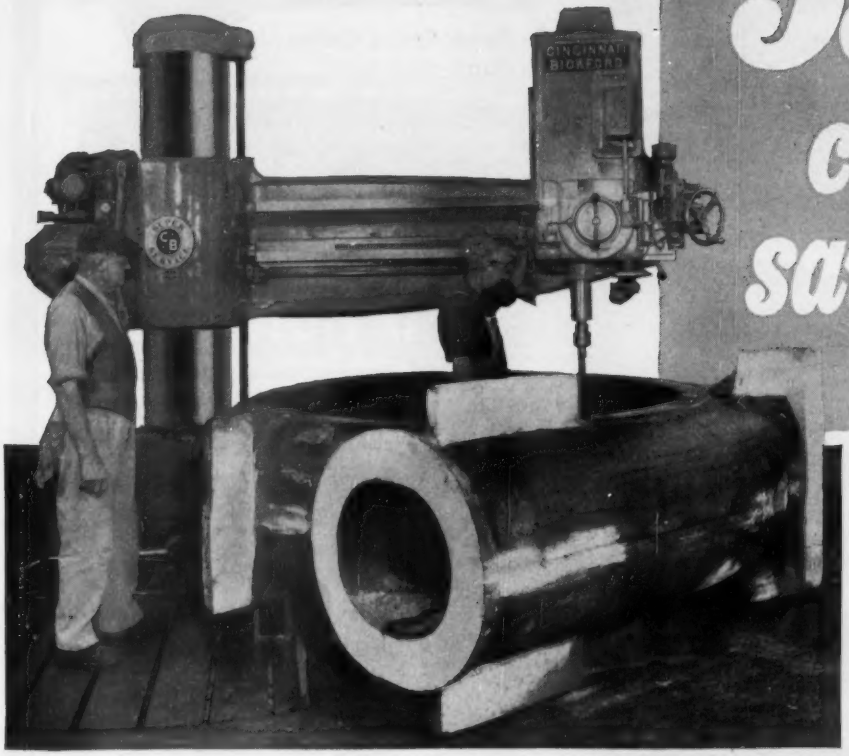


Here is a 50 hp CSM Simplex Milling Machine with a No. 5 Quick-Change Ram Type Head.

Our complete line of CSM milling machines is described and illustrated in detail in this big 20-page catalog. For your copy write to Kearney & Trecker Corp., Special Machinery Division, 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

This BICKFORD effected a 35% cost saving!

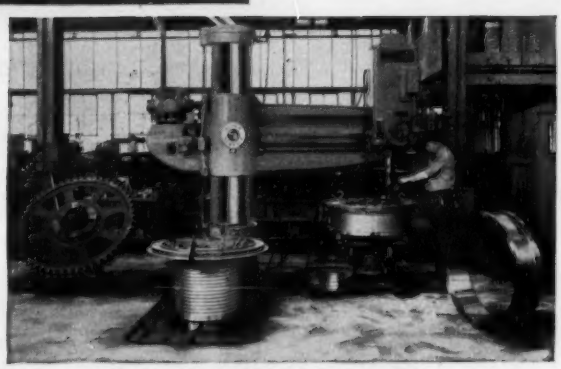


Drilling large centrifical dredge pump housing. This 7 arm, 19" diameter column Cincinnati Bickford Super Service, equipped with triple base, allows setup of two jobs while the third is in process.

The efficient drilling department at the National Supply Company of California effected a 35% cost reduction in drilling operations with this Cincinnati Bickford Super Service Radial Drill.

Here the many feeds and speeds of the Cincinnati Bickford Super Service Radial Drills—and their rigid construction—combined with their easy operation—handle a variety of heavy duty jobs with outstanding dependability at low costs.

Write for Booklet R-29 on these powerful, accurate Cincinnati Bickford Super Service Radial Drills.



Drilling and tapping a clutch housing. Note the second housing ready for drilling on one of the triple bases of the machine. No time lost in setup.

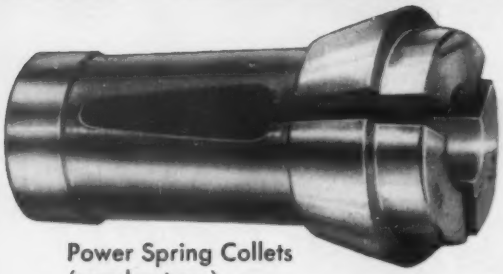
Photos—Courtesy of National Supply Co., Torrence, Calif.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

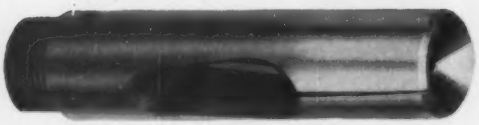
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

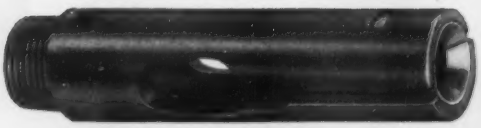


Power Spring Collets
(regular type)

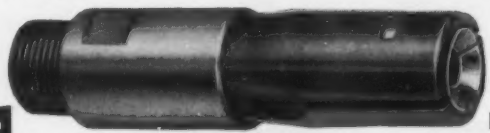
Power Spring Collets
(taper nose type)



Feed Fingers (regular type)



Master Feed Fingers and Pads



Master Feed Fingers
with Adjustable Tension

HARDINGE
ELMIRA, N.Y.

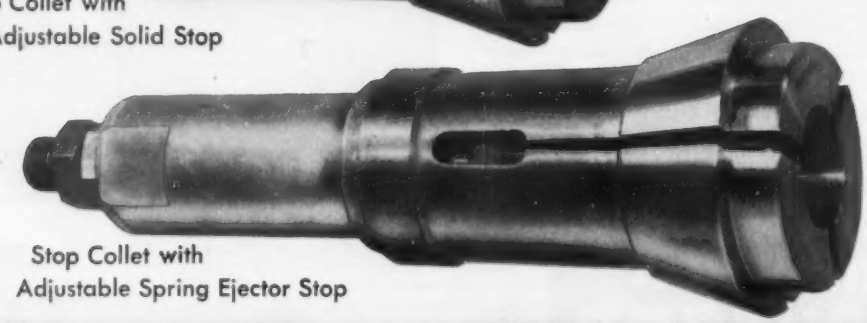
PRECISION PRODUCTS
for BROWN & SHARPE machines

For maximum production efficiency, specify Hardinge precision products for your Brown & Sharpe Automatics and Wire Feed Screw Machines.

Reduce tooling costs and step up production with these and other Hardinge precision products engineered, customer-shop tested, and approved for Brown & Sharpe machines. Write for Catalog 36 — contains complete descriptions, specifications, and ordering information.

Deliveries from stock

Stop Collet with
Adjustable Solid Stop



Stop Collet with
Adjustable Spring Ejector Stop

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

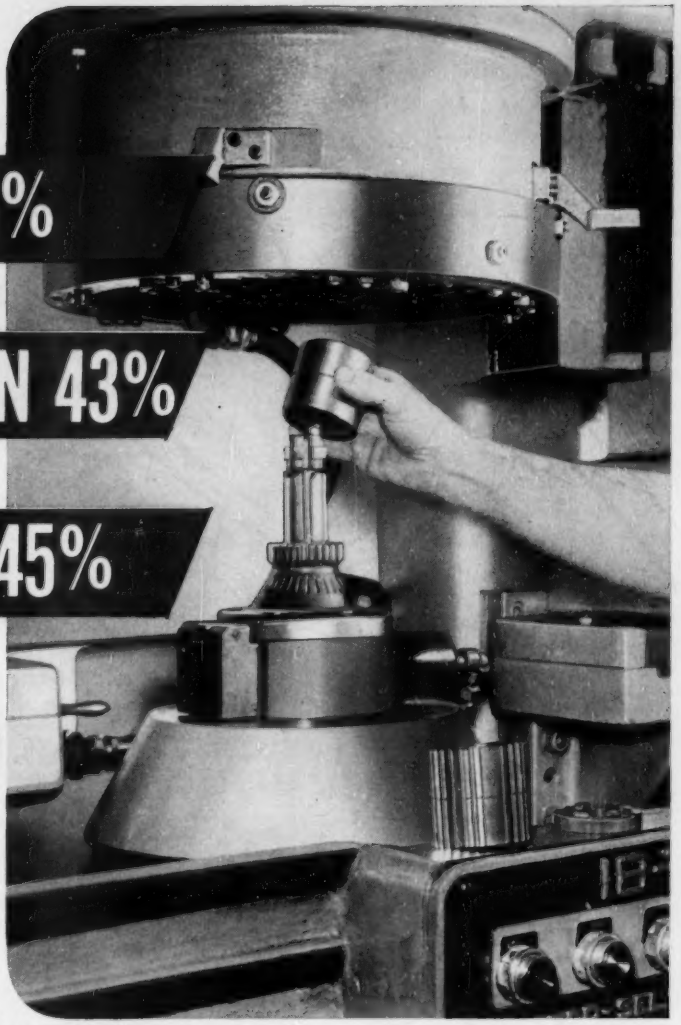
Offices in principal cities. Export office 269 Lafayette St., New York 12, N. Y.

TOOL LIFE UP 75%

DOWN-TIME DOWN 43%

PRODUCTION UP 45%

USING SHEAR-SPEED SOLUBLE OIL



on multiple "single-point" form cutting operation in the plant of a large auto manufacturer. IMPARTIAL PRODUCTION TESTS of previous "best" cutting fluid vs. SHEAR-SPEED Soluble Oil were run under *exactly* similar conditions—same machine, same parts, same tool grinding, same coolant flow.

JOB SPECS: 24-tooth transmission gears, 2.5" pitch dia., 1.185" face width, cut two at a time on gear shaper from SAE bar steel, 207-228 BHN.

ACTUAL TEST DATA
(averaged)

■ Previous Best Cutting Fluid

■ SHEAR-SPEED Soluble Oil

OVERALL TOOL LIFE	15,200 parts / 26,600 parts	75% improvement
DOWN-TIME PER PART	.0625 min. / .0357 min.	43% improvement
PARTS PER HR. (INC. DOWN-TIME, ETC.)	86 / 125	45% improvement
CYCLE TIME* (FLOOR-TO-FLOOR)	55 sec. / 35 sec.	36% improvement

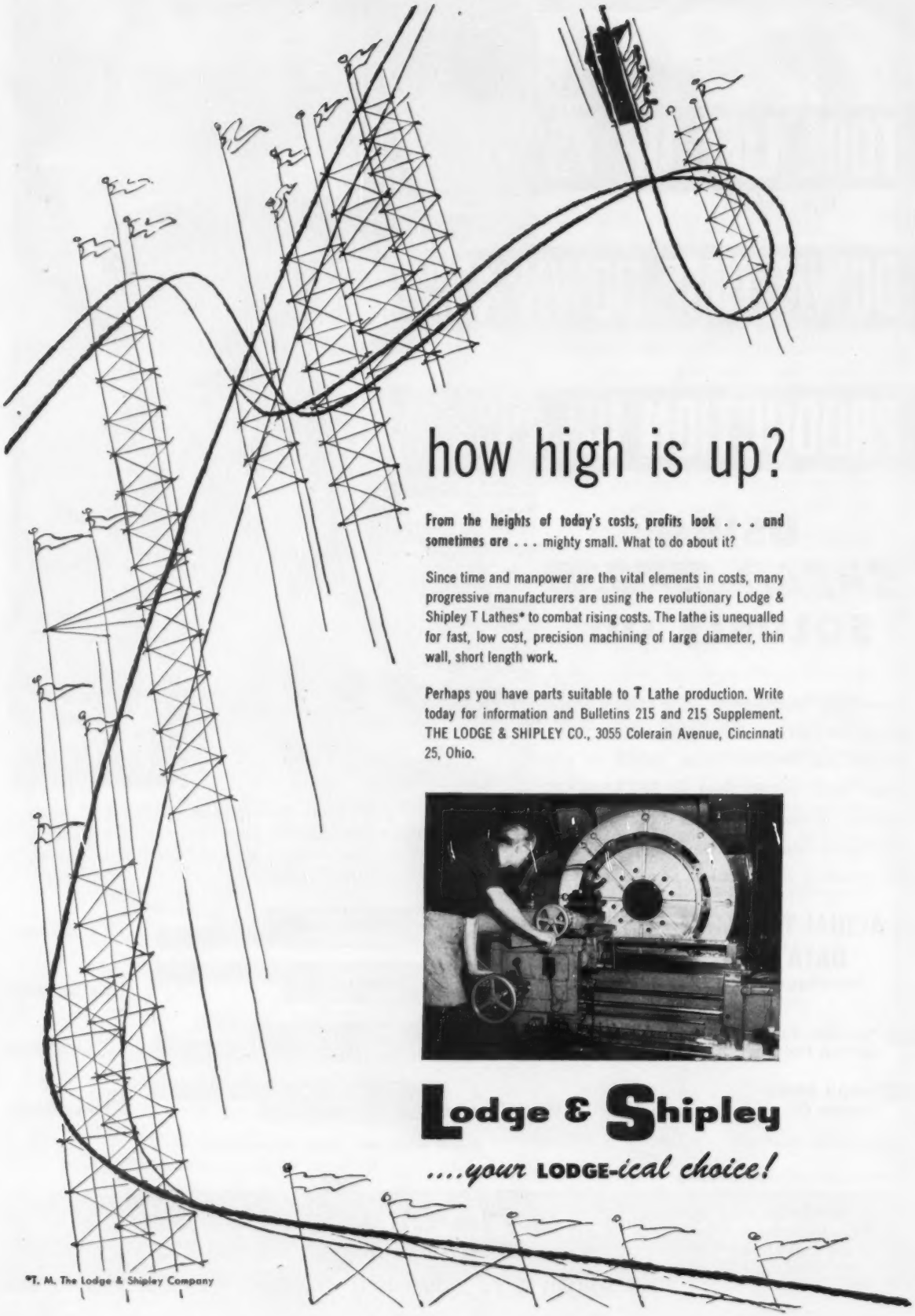
*Tool life increased despite higher cutting speed.

A few select sales areas still available.

Convince yourself of the amazing advantages and versatility of SHEAR-SPEED Soluble Oil in your own plant. Sold only on a satisfaction guaranteed test basis. Write for Bulletin SO-53 and price list.

SHEAR-SPEED CHEMICAL PRODUCTS

7125 E. McNICHOLS RD. *A Division of Michigan Tool Co.* DETROIT 12, MICH.



how high is up?

From the heights of today's costs, profits look . . . and sometimes are . . . mighty small. What to do about it?

Since time and manpower are the vital elements in costs, many progressive manufacturers are using the revolutionary Lodge & Shipley T Lathes* to combat rising costs. The lathe is unequalled for fast, low cost, precision machining of large diameter, thin wall, short length work.

Perhaps you have parts suitable to T Lathe production. Write today for information and Bulletins 215 and 215 Supplement. THE LODGE & SHIPLEY CO., 3055 Colerain Avenue, Cincinnati 25, Ohio.

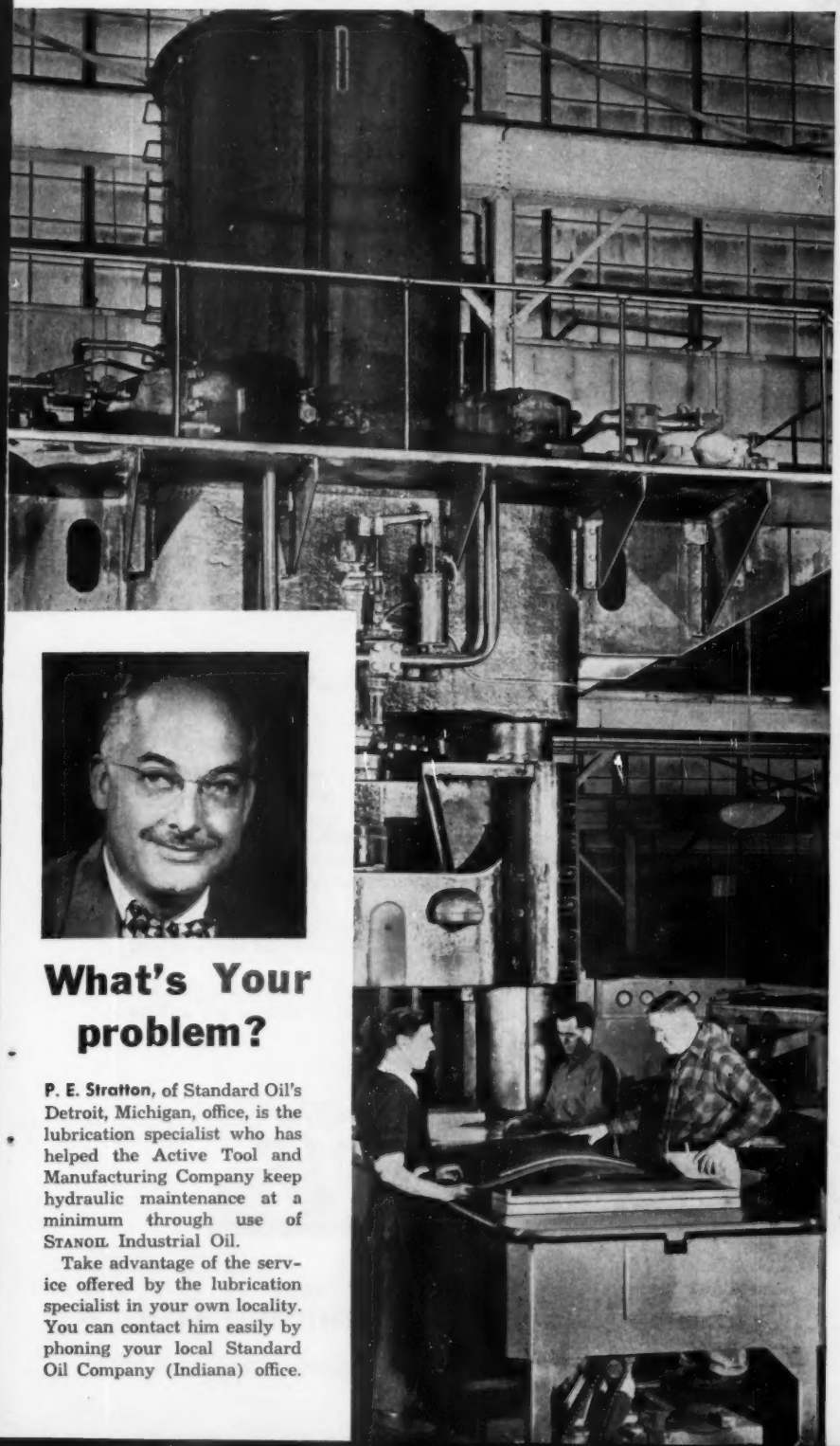
Lodge & Shipley

....your **LODGE**-*ical choice!*

*T. M. The Lodge & Shipley Company

STANOIL
TRADE MARK
Industrial Oil

How they keep hydraulic maintenance to a minimum



● Officials of the Active Tool and Manufacturing Company, Detroit, Michigan, count on trouble-free hydraulic operation of this giant press. They place much of their confidence in the performance of STANOIL Industrial Oil—and with good reason.

Recommended by a Standard Oil lubrication specialist, STANOIL has served in the hydraulic system of this press for over four years. In all of that time, it has not been necessary to replace the original fill of oil nor has the hydraulic system once needed to be cleaned. Periodic tests of oil samples have shown that STANOIL, despite hard service and high oil-operating temperatures, has maintained a lubricating quality comparable with new oil.

You, too, can rely on this unique, versatile oil to give you clean, dependable service, in a wide variety of equipment. The Standard Oil lubrication specialist serving your area of the Midwest will be glad to show you operating records covering the many applications of STANOIL. Phone him at your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

What's Your problem?

P. E. Stratton, of Standard Oil's Detroit, Michigan, office, is the lubrication specialist who has helped the Active Tool and Manufacturing Company keep hydraulic maintenance at a minimum through use of STANOIL Industrial Oil.

Take advantage of the service offered by the lubrication specialist in your own locality. You can contact him easily by phoning your local Standard Oil Company (Indiana) office.

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STANDARD OIL COMPANY

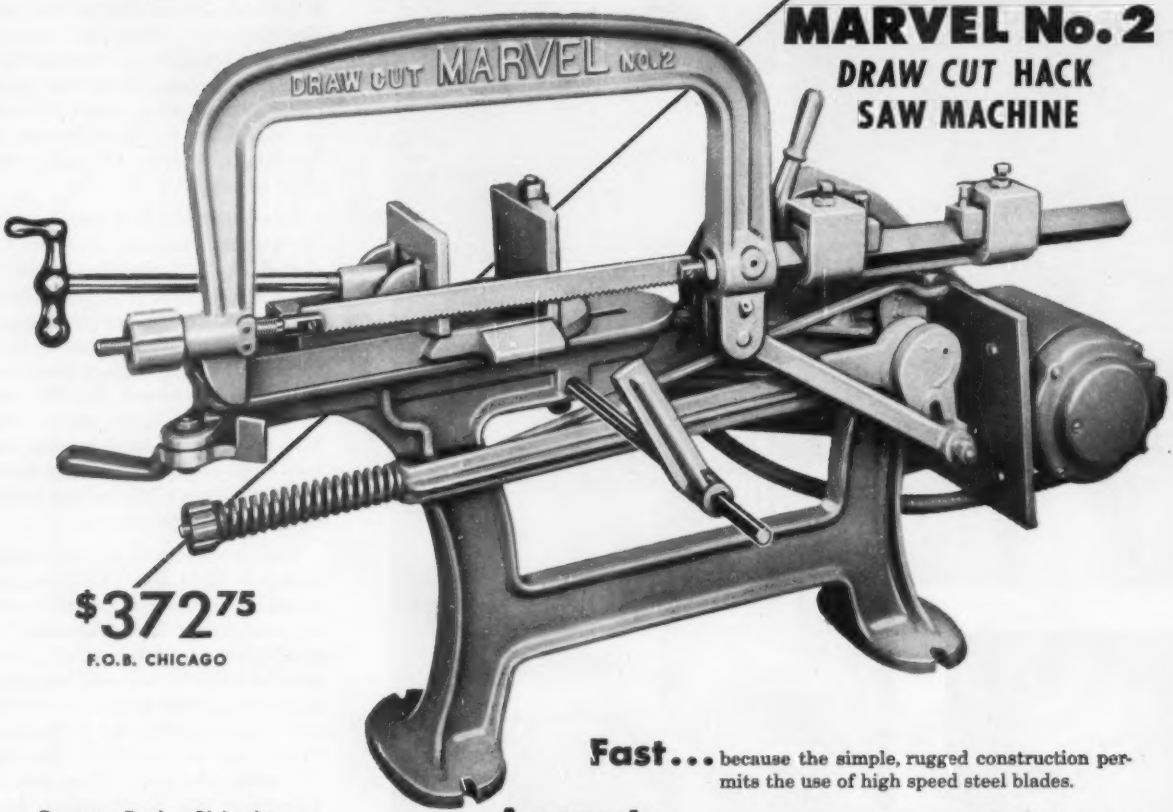
(Indiana)

For... General-Purpose Sawing

FAST—ACCURATE—ECONOMICAL—DRY CUTTING

Capacity up to 8" round

Improved
MARVEL No. 2
DRAW CUT HACK SAW MACHINE



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Fast... because the simple, rugged construction permits the use of high speed steel blades.

Accurate... because the improved Saw Frame with clamping type blade holders holds the blade in perfect alignment and proper tension.

Economical... because of its automatic relief on the return stroke, the blade will last and last and last.

Dry Cutting... because modern high speed steel blades will operate efficiently at 60 strokes per minute without a coolant.

See your Dealer. If he does not stock MARVEL Saws, he can get them quickly. Or simply write us for literature and delivery. When buying hack saw blades insist that your dealer furnishes genuine MARVEL High-Speed-Edge Hack Saw Blades—they are unbreakable!

MARVEL *Metal Cutting* **SAWS**
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. · 5700 Bloomingdale Ave. · CHICAGO 39, ILL.

Anneals 7000/hr

Allis-Chalmers 20-kw Induction Heater shown with A-C designed and built work-handling fixture.

...Steel Shell Cases...Almost 2 Per Second!

In pre-production tests, this Allis-Chalmers Induction Heater annealed steel shell cases at the amazing rate of 7000 per hour. Not only is this heating unit a fast worker, but it's a clean worker — and a cool one, too! It puts the heat into the metal where it belongs — holds down the ambient.

Get Expert Help

Whether your problem is annealing or hardening, brazing or soldering, find out what an Allis-Chalmers Induction Heater can do for you. You're sure to get increased production, or improved quality, or fewer rejects, or maybe all of these. Standard ratings up to 100-kw output are available. Call your nearby Allis-Chalmers District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Allis-Chalmers
Milwaukee 1, Wisconsin

I'm interested in:

- ☐ *brazing*
- ☐ *soldering*
- ☐ *annealing*
- ☐ *hardening*

Name .....

Title .....

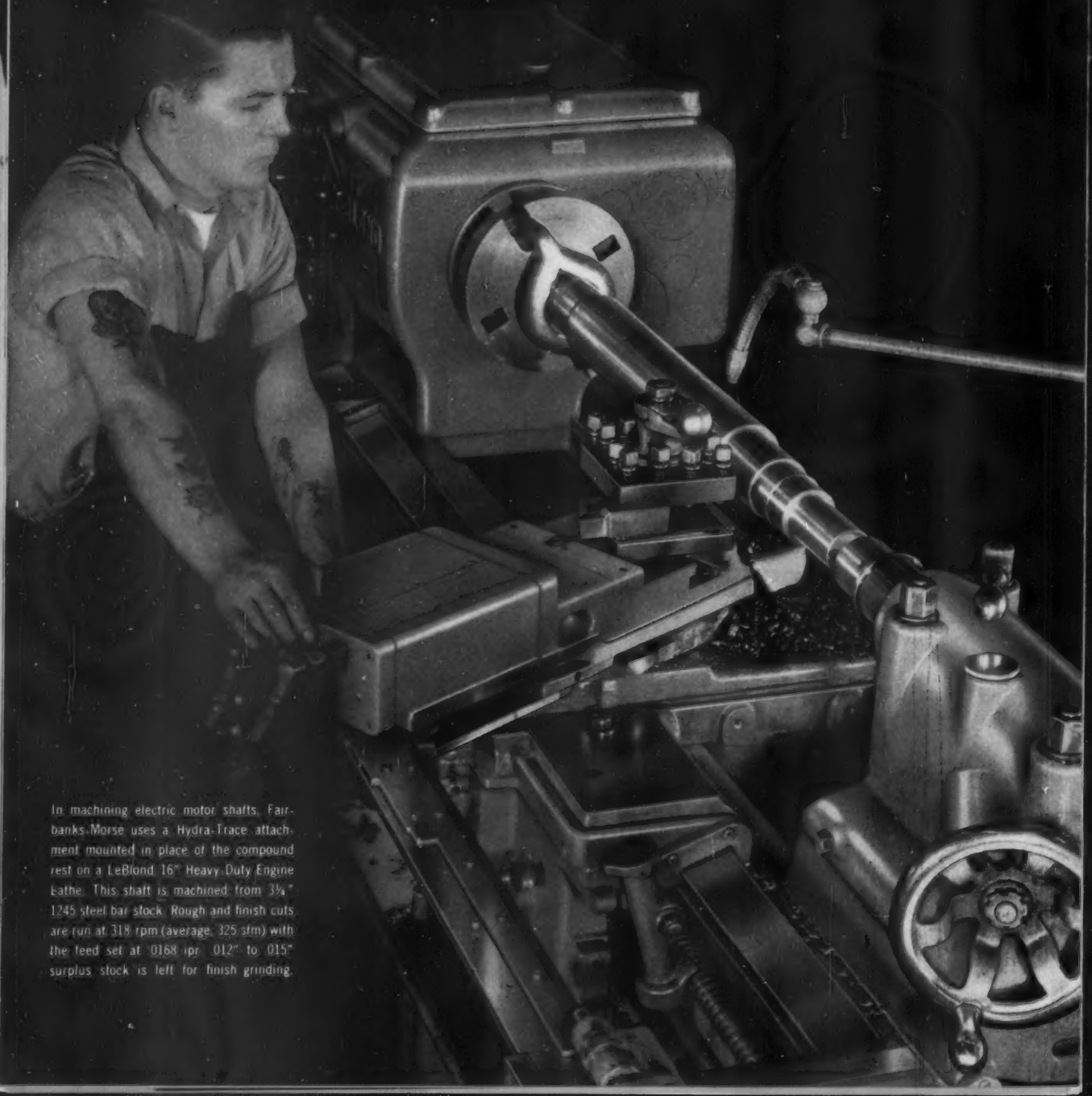
Company .....

Street .....

City ..... State A-4060

ALLIS-CHALMERS

Fairbanks-Morse saves floor space,



In machining electric motor shafts, Fairbanks-Morse uses a Hydra-Trace attachment mounted in place of the compound rest on a LeBlond 16" Heavy-Duty Engine Lathe. This shaft is machined from 3¼" 1245 steel bar stock. Rough and finish cuts are run at 318 rpm (average, 325 sfm) with the feed set at .0168 ipr. .012" to .015" surplus stock is left for finish grinding.

slashes tool costs with Hydra-Trace

LeBlond Lathe plus Hydra-Trace replaces two automatics—machines 55 different shafts in lots of 25 to 150.

Before Hydra-Trace, F-M produced its motor shafts on a pair of automatic lathes. Each turned one end of the step shafts; each used seven tools and two tool blocks. Frequent set-up changes—*each requiring eight hours*—more than ate up the time saved by automatic production.

Then Fairbanks-Morse consulted our Chicago office, purchased a 16" Heavy-Duty Engine Lathe equipped with Hydra-Trace. Here are the results:

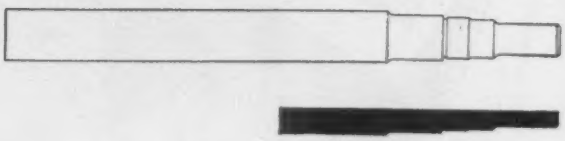
Set-up time became Production Time. Hydra-Trace setup per shaft end takes only 15 minutes—for a total of 30 minutes. Result—7½ former setup hours became available for production.

Floor space saved. One machine does the work of two. (Overall average production is equal.)

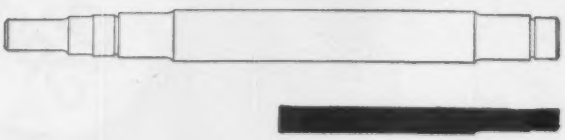
Tool costs slashed. Two tools replace 14. Tool life increased 33%.

Storage problem simplified. Hydra-Trace templates are flat, easily made, much simpler to store and locate than bulky tool blocks (or master shafts).

Hydra-Trace can replace the compound rest of virtually any LeBlond lathe built since 1935. And operators of only average skill can easily operate this heavy-duty, hydraulic tracer.



A typical shaft-turning operation—Hydra-Trace automatically follows template 1 as first-phase rough and finish cuts are taken on one run of shafts.



Then, the shaft ends are reversed. The second template is set and the second machining phase completed.

Whether you are cutting step shafts, contour facing or turning forms—a LeBlond Heavy-Duty Lathe with Hydra-Trace will prove the most versatile, the most dependable machine in your shop. You can use it as a duplicating lathe on production runs; then, in minutes, replace the Hydra-Trace attachment with the standard compound rest for regular work.

For more information on LeBlond Heavy-Duty Lathes, see your nearby LeBlond distributor or write—

THE R. K. LEBLOND MACHINE TOOL CO. CINCINNATI 8, OHIO

Write for Bulletin HT-4A
for the complete Hydra-Trace story.

*TRADE MARK, Registered U.S. Pat. Off.

turned faster by

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 64 YEARS

"Specific®" TAPS CUT YOUR TAPPING COSTS

1.	If you use taps in just one kind of material	**Then order 'DETROIT' Specific taps for that material.**
2.	If taps are used mostly for a specific material but also occasionally for other materials	**Then order 'DETROIT' Specific taps for that specific material. They do a good job on other materials, too.**
3.	If you use taps interchangeably for different materials	**Then order 'DETROIT' general-purpose taps.**

Every 'DETROIT' Specific tap is clearly marked on the shank with the name of the specific material for which it is ideally suited. Ask for Catalog-Bulletin #ST-53.

DETROIT TAP & TOOL CO.

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The third eye of inspector Harford
Inspector Emma Harford's third eye is a "Comparator," a machine that magnifies Esterbrook Renew-Points to sixty-two times normal size. It checks point outline, and width of ink slit. Variations from standard are quickly spotted, rejected and scrapped.
Fountain Pen.
Searching inspections and constant attentions to quality details mean no "comebacks" from sales of Esterbrooks—and help to explain the ever-increasing popularity of this, the pen with "the right point for way YOU write."
Esterbrook
FOUNTAIN PEN
ESTERBROOK . . . America's Pen Name Since 1858

P.S.

Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL—*throughout your production lines.* Write for Catalog No. 402. One of our eleven models will fit your needs.

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Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

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Please send Comparator Catalog No. 402.

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COMPANY _____

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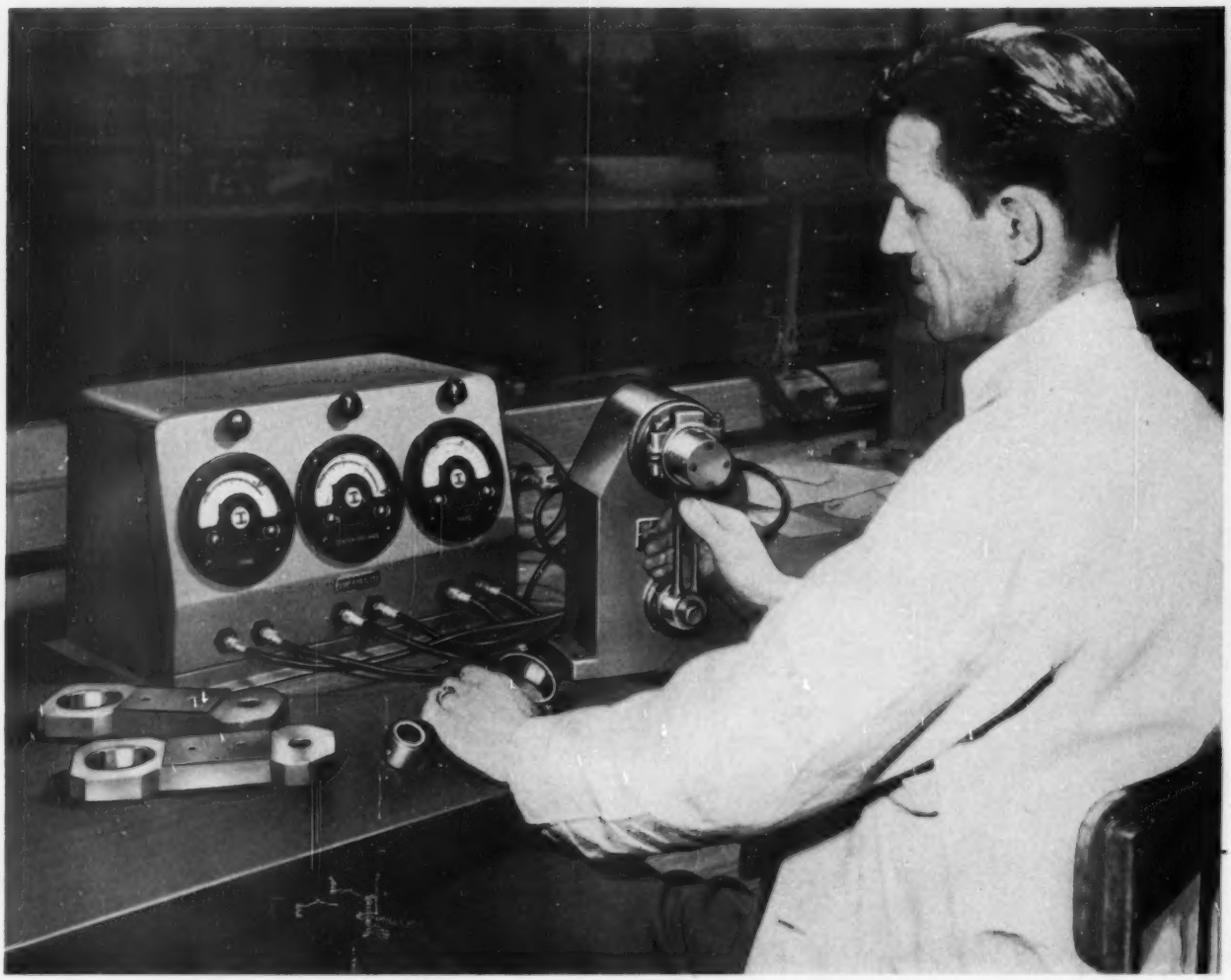
CITY _____ STATE _____

Only a Taft-Peirce *Offers these 4*



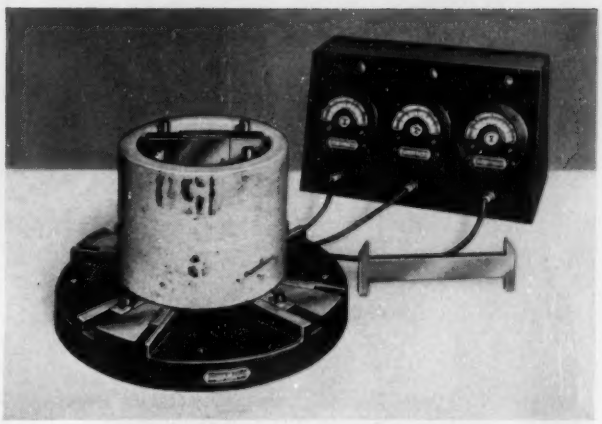
1 Computes Difficult Measurements Automatically

A T-P Computing CompAIRator eliminates the need for two measurements and a calculation. One gage, one dial, measures, calculates and indicates the final answer instantly on the dial face, for such difficult measurements as center distance without respect to hole size, deviation from angle or taper, concentricity, and squareness of bore to face.

The three dial Computing CompAIRator pictured above does the work of six dials in checking bend, twist, and center distance of connecting rods.

THE TAFT-PEIRCE MANUFACTURING

CompAIRator Air Gage
Great Features

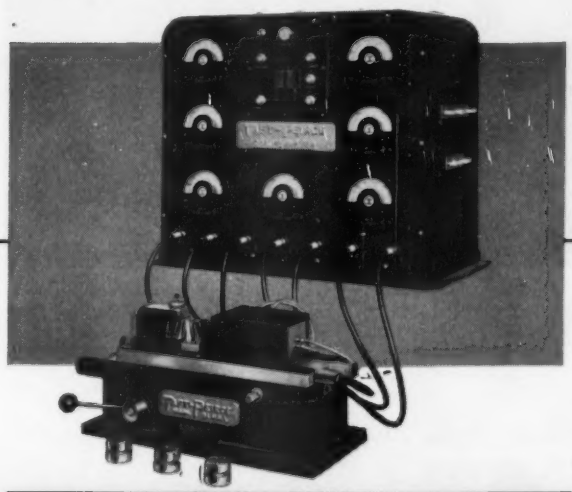


2 Checks Diameters as small as .055″

The velocity-type circuit of a T-P CompAIRator, which permits use of tiny air passages and nozzles, makes these small measurements possible quickly and accurately.

3 Checks Tolerances up to 120 thousandths

T-P CompAIRator air-contact members can be furnished to permit measurements within this wider tolerance range with a standard unit.



4 Gives Simultaneous Signal Light and Dial Indications

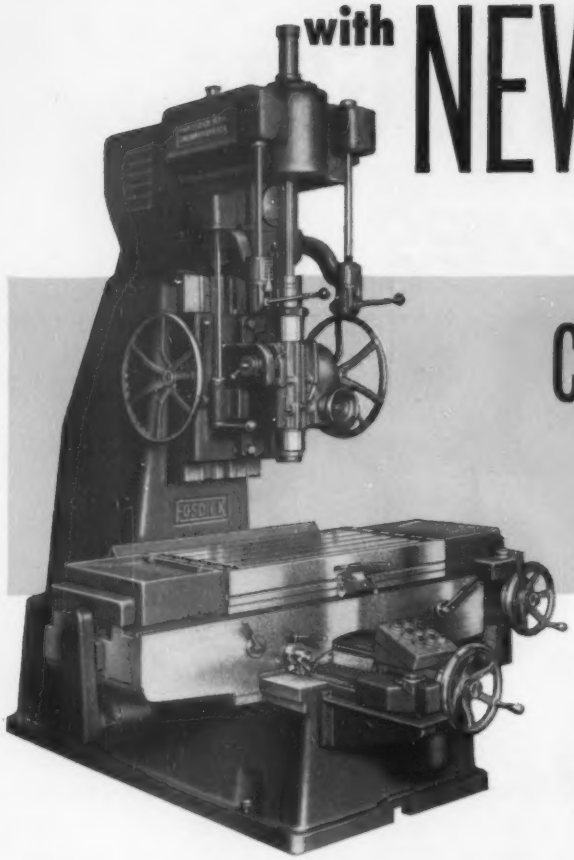
A T-P Air-Electric CompAIRator offers the ultimate in speed for multi-dimensional gaging. It provides both exact size on standard dials *and* light indications for oversize, undersize, and within tolerance conditions.

Couple these great features with the greater speed, accuracy, and dependability of a T-P CompAIRator — and you know why thousands use and prefer them. Write for demonstration at your plant. Prove the time and money saving differences for yourself.

T-P means Top Precision

COMPANY, WOONSOCKET, RHODE ISLAND

with NEW Fosdick BF Spindle

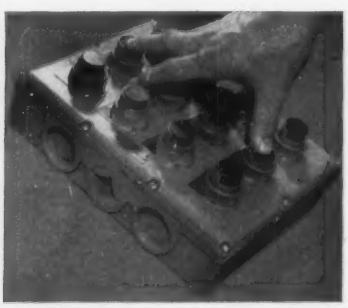


change boring tools repeat hole size

No more "cut and try" resetting of boring tools every time you change them! With the new BF Spindle you can change tools in seconds with such accuracy that hole sizes are repeated within ± .0001", *without* resetting. Slash time drastically, whether boring a "one-shot" jig with many different size holes or producing work where repetitive precision is essential.

Fast tool changing with Automatic Positioning for High-Speed, Precision Boring to a NEW Degree never before obtainable.

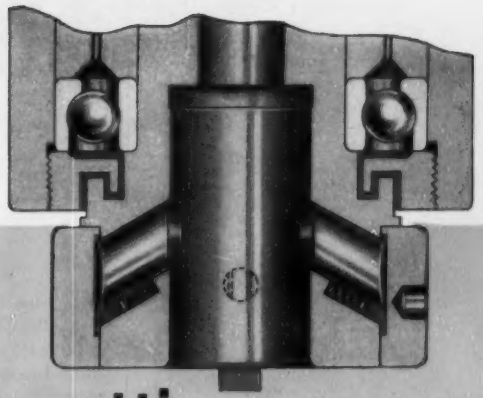
Drop duplicating bars in place—position work for first hole and bore. Then...



PRESS the button—and in the twinkling of an eye—you're positioned within ± .0001" for the next operation.

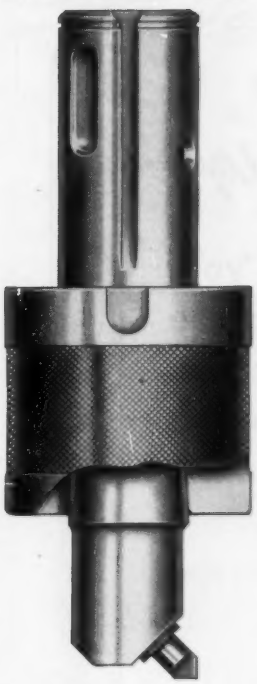
Fosdick builds Automatic Positioning into its Jig Borers to give you ± .0001" table positioning *in seconds* simply by pressing a button—even with inexperienced operators. Only two easily-made, easily-stored duplicating bars are needed for each job. Once bars are set, work initially positioned, press button and, in seconds, you're ready for the next operation! This is Fosdick's precision combination—*One hole or a thousand, same size or different, you'll hold both position and hole size to ± .0001"!*

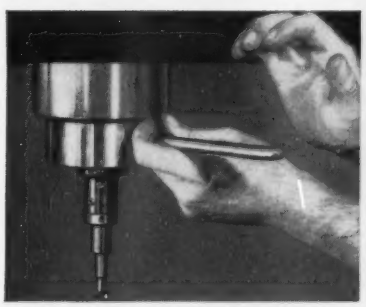
For more information write for these bulletins: Fosdick Jig Borer.....Bulletin 42A Automatic Positioning .....Bulletin 42PA BF Spindle...Bulletin BFA



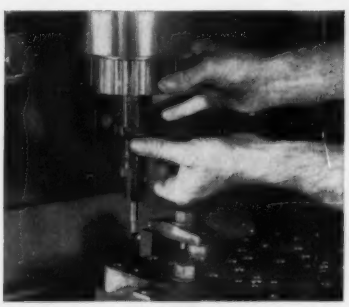
in seconds... to ±.0001" without resetting

High-precision tool holder is built integral with Jig Borer spindle. Straight-shank tool adapters fit holder precisely – wipe surface clean as tool is inserted, keep dust and dirt from upsetting precision fit. Both adapters and tools "keyed-in" for identical repositioned accuracy.



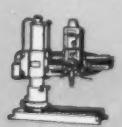


With the BF Spindle, you can change boring tools while the machine positions. Simply loosen cam ring with spanner wrench. Further hand rotation releases tool.



Then insert new tool, tighten cam ring and you have Fosdick's precision combination—tool changing and work positioning both to ± .0001" in a matter of seconds!

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

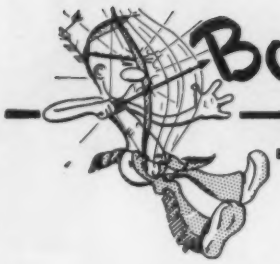
THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

This Sign

is your guarantee of top performance ..in a reamer ...in a distributor.

L&I *The Reamer Specialists*

LAVALLEE & IDE, INC.
CHICOPEE, MASS.



Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Paper Fetish

The item in Talking Shop—"Paper Fetish"—(*AM*, Oct 26, '53, p161) is one that all managerial personnel should read and ponder. Unnecessary paper work is costing business and taxpayers large sums of money every year—probably millions, all told. It probably began with the introduction of what was called scientific management, and may have been a natural reaction to some of the slip-shod methods that had previously prevailed. Perhaps overenthusiastic salesmen of carbon paper are partly responsible by making it easy to get many duplicate copies of orders, memos, and other written notes. While one carbon copy is usually essential, the need of even the second copy may often be debatable. But the ease of obtaining duplicate copies too often makes someone down the line feel that he should also have a copy, which he seldom reads, and the trouble has begun.

I am reminded of one very successful shop manager, who has become a well-known national figure, who was impressed years ago with the need for shop records in each department. Some years later he told me:

"When I took this job I was convinced that it was necessary to have interdepartment records of every piece of work. Each piece going from one department to another had to be recorded. Now I am trying to get rid of most of the paper work, as it is often cheaper to have a few mistakes than to have all the records, which we seldom use."

Another manager I knew asked the head of his cost department about the costs of some new machines they were building. After some "hemming and hawing" he was told that the records were about three weeks behind and that the cost department couldn't be sure of the costs. At this the quick-tempered manager told his cost department head to have all the records fed to the powerhouse boilers. "Until," he said, "you can show me costs up to yesterday, don't try to keep any records at all! I'm not interested in ancient history."

Probably government offices, especially those of the armed forces, are among the worst offenders in this line. They have tons of paper records that are seldom looked at. Perhaps all institutions, private and public,

GRINETICS

By D G SMITH

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DOES CARBIDE COST TOO MUCH?

LOOK AT THIS COMPARISON BETWEEN WESSONMETAL AND HIGH SPEED STEEL

WESSONMETAL Cemented Carbide

WESSON TOOLS

Actual Job

Caterpillar Tractor Co.

Part Name..Cutting Edge Bulldozer Scraper Blade
Operation Description...Form Edge Scraper Blade
Machine Model—Type..Rockford Planer Series #4
Tool Type.....MX-7 Multicut Planer Holder
Planing Speed.....100 S.F.M.
Feed.....025
Depth of Cut.....0 to ⅞" Max.

with WESSONMETAL

Your Higher ORIGINAL COST RESULTS in LESS COST per PIECE!

OLD H. S. STEEL METHOD	NEW WESSONMETAL METHOD
Pieces per Grind.....½ to 1	Pieces per Grind.....13½
Total Tool Cost.....$49.25	Total Tool Cost.....$97.[illegible]
Average Pieces per tool life.....24 Pieces	Average Pieces per tool life.....324 Pieces
Tool Cost per Piece.....$.60	Tool Cost per Piece.....$.07

HOW IS YOUR PRODUCTION SCORE CARD?

Call the Wesson Tool Engineer in your area for complete service. Ask to see Wessen's new movie "This Carbide Age."

WESSONMETAL Cemented Carbide

WESSON METAL CORPORATION
LEXINGTON 34, KENTUCKY

NOBLEWEST... ALWAYS AHEAD
WITH
BETTER MARKING
AT LOWER COST!

NOW...
NEW
DIAL FEED
MARKING
MACHINE

SPEED-MARKS 12,000 PIECES PER HOUR
...Automatically

Tooled for high production marking of small metal parts (12,000 pieces per hour), Model 347 illustrated above, is a good example of Noblewest's ability to keep ahead of industry's demands for constantly higher marking speeds at lower cost. Featuring a hopper and dial feed combination, parts are fed to the machine by the hopper, marked and automatically ejected. Spring pressure controls the depth of the mark and insures uniform depth of mark regardless of slight variations in diameter. Whatever your needs for metal marking, Noblewest makes the machines, marking dies and work-holding fixtures for doing the complete job faster, better, at lower cost. And remember, Noblewest Roll-Marking is *permanent* marking—*good for the life of your product.* For complete details write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH
NOBLEWEST Roll-O-Matic MARKING
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

find themselves in the same boat.

I recall an incident that happened many years ago when Fred Taylor's scientific management plans were much in the limelight. A friend remarked, "You ought to see Jimmy Brown's office system. It's scientific. He has things so systematized that he can tell at a glance just what he should have gotten done the day before yesterday."

FRED COLVIN
Point Pleasant, NJ

Protest

I wish to protest most strongly against Mr. Colvin's suggestion (*AM*—Nov 23 '53, p98) that a machine shop foreman ought to have a college degree. No foreman is worth his salt unless he has had a good many years actual shop experience. All too often, a college teaches a man what he cannot do, but the man in the shop still finds ways and means of doing it.

What is the college boy going to say when an experienced machinist has a tough machining problem and comes to him for advice? He can't look it up in a book, because books don't have the answer. Sure, the degree is useful to back up 10 years of experience, but how many men with degrees are going to work in the shop for ten years to get the necessary qualifying experience?

JOHN HICKOCK
Cleveland

White Collars

Your article on Apprentice Training (*AM*—Nov 9 '53, p129) was most interesting, and I would like to make a few comments. 1) Manual labor has gained in prestige since the Depression, and particularly during the war, when manual workers were called "Defense Workers." 2) The father who said, "I want my boy to have a better break than I did," cannot be blamed, because, in general, white collar workers had better working conditions than manual workers. As the white collar worker was closer to the boss, he got benefits that never reached his manual brother. As the difference in working conditions shrank, so the prestige of manual labor rose. 3) Until now, young re-

cruits for manual work were the ones who were not too bright in school. Students who got high marks in languages, history, and even the sciences, were never encouraged to take up trades. 4) A shorter work week, hours from nine to five, and longer vacations would appeal to the more ambitious men who want the leisure time to better themselves. 5) Stenographers, engineers, lawyers, etc, do not get paid while they go to school, so apprentices should not expect high wages while they learn.

Th Speros
Suffern, N Y

Sorry! We Disagree

Your Talking Shop item under the title of "Repeat Patterns" (*AM*—Sept 28 '53, p 163) reminds us of a little episode in our first term of High School geometry.

Our teacher asked me how many regular convex solids there are. My answer was: "The tetrahedron, with four faces; the hexahedron, with six; the octahedron, with eight; and the icosahedron, with twenty faces." The teacher then told me I had failed to include one more. "Oh, yes," I added, "one solid of fourteen faces."

Neither the teacher nor the rest of the class agreed, and all said the "missing" regular solid was twelve-faced and designated dodecahedron. I was therefore condemned to make twelve dodecahedrons of cardboard —so I would not forget any more that the number is twelve, not fourteen.

A Blasco
J Sacristan
Standard Electrica, S.A.
Madrid, Spain

Perhaps we, too, should be set to the task of making twelve dodecahedrons as penance for our mistake. But we don't feel too bad about it because we were surprised to find that a number of engineers to whom we described the problem could not even begin to approach a solution. Apparently it is difficult for the average man some years out of college. —Ed.

Establish Highest Efficiency
In *Your* Toolroom
With Easy-to-Operate
OLIVER ACE
Universal Tool and Cutter Grinders

Get
- Precision
- Speed
- Economy

For dependability and ease of operation, the Oliver ACE is especially qualified in the grinding of tungsten-carbide and high speed milling cutters and tools. Extremely accurate, it has only one sliding part with ample bearing, efficiently protected from dust.

The Oliver Ace IS *Universal*—it handles a wider range of cutters than the ordinary cutter grinder—and all this with only two simple fixtures. Requiring no computation, the direct reading for clearances on the ACE increases the operator's efficiency in grinding the most difficult cutters (no stoop, no squat, no squint).

Nearly 40 years of designing and building lasting toolroom machinery stand behind the Oliver Ace. Easy to set up . . . it also effects economies in floor space and less outlay in dollars for this truly superior type machine. Let OLIVER show you the WAY to speedier, more economical precision tool and cutter grinding.

Direct Reading for Clearance
—Reduces Fatigue
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Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular saws.

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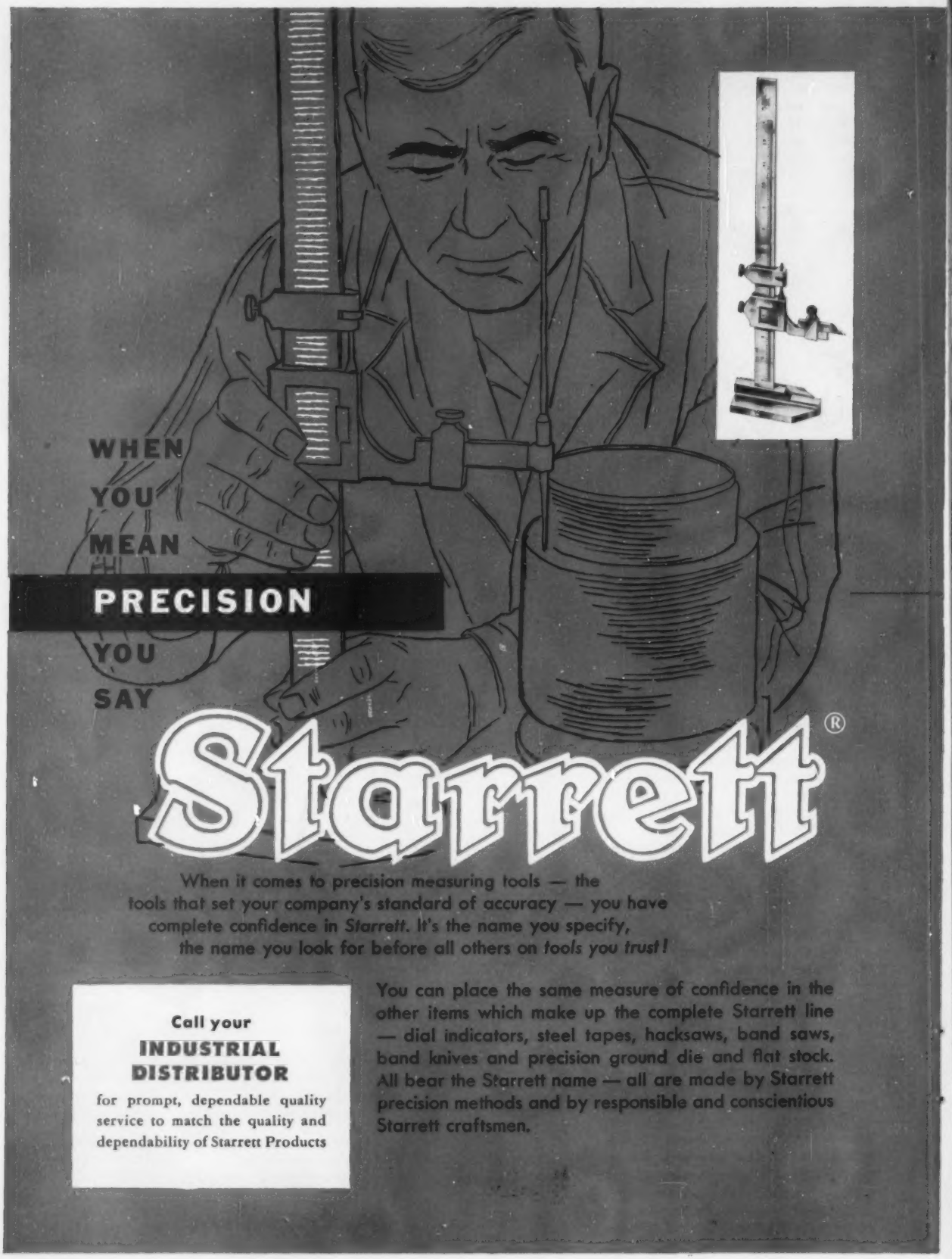

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for prompt, dependable quality service to match the quality and dependability of Starrett Products

You can place the same measure of confidence in the other items which make up the complete Starrett line — dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground die and flat stock. All bear the Starrett name — all are made by Starrett precision methods and by responsible and conscientious Starrett craftsmen.

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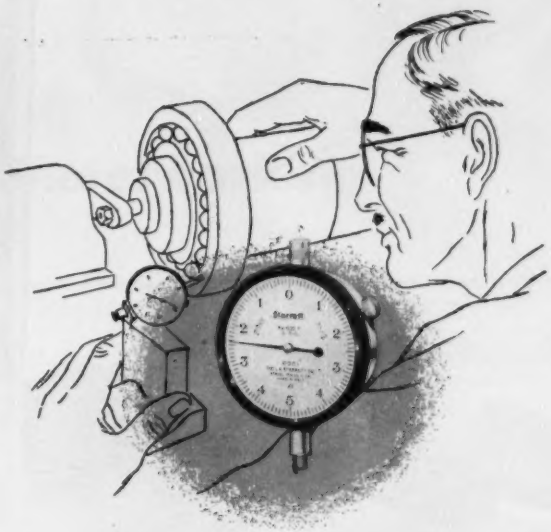

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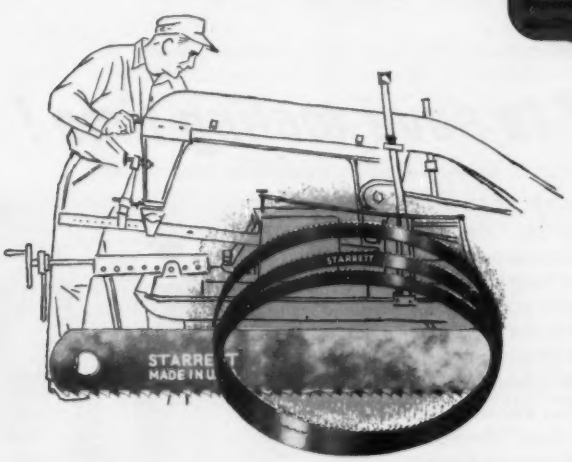

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295 sizes in air, oil, oil or water and water hardening types.

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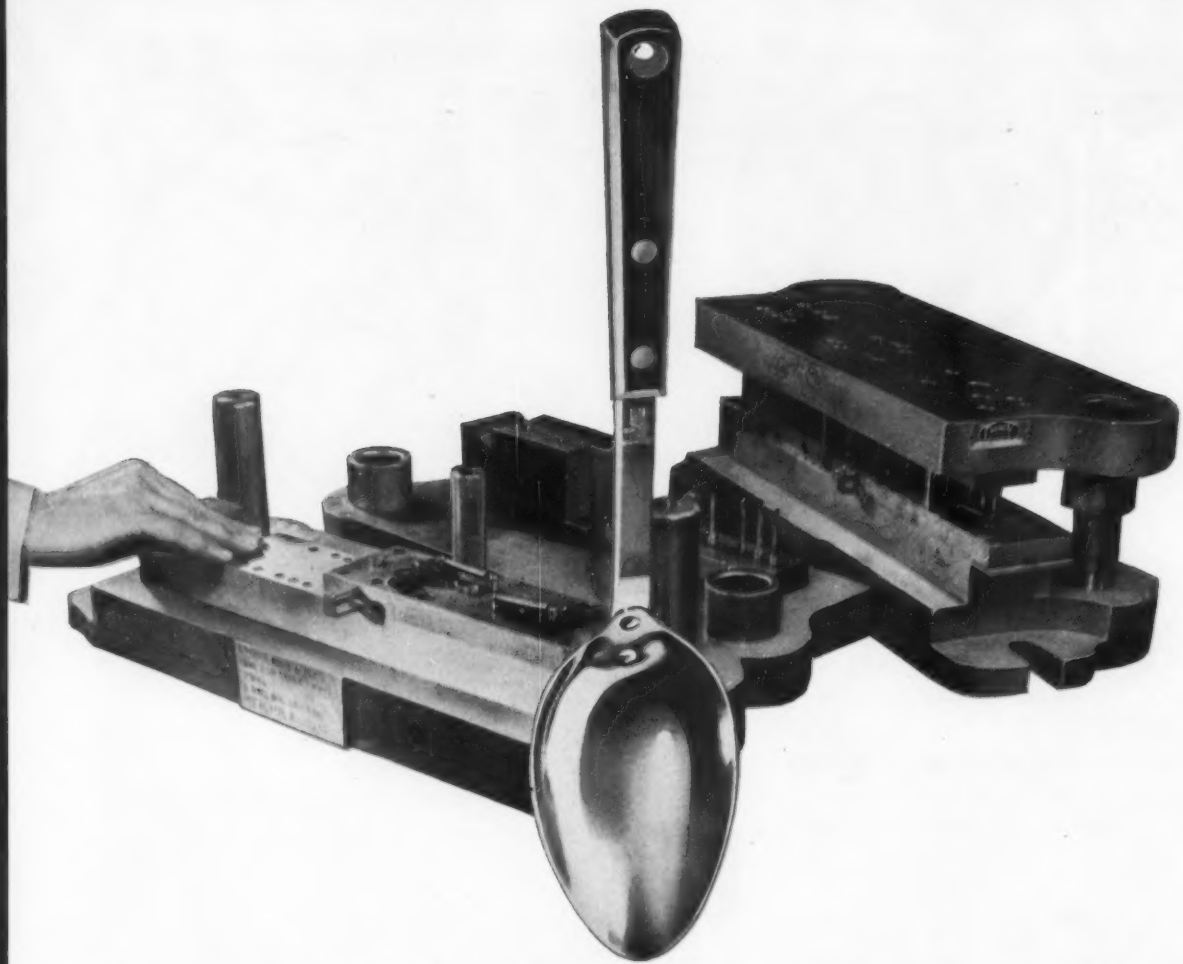
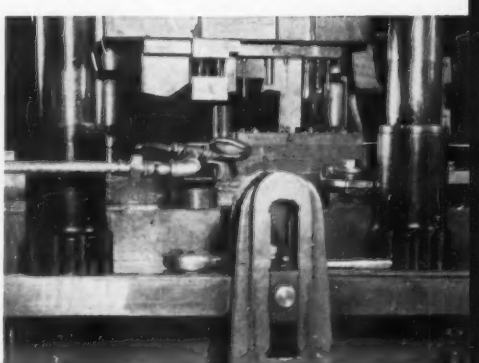


Ekco DEPENDS ON DANLY to save tooling time!

This popular basting spoon is one of thousands of famous household items made by Ekco Products Company in dies mounted in Danly Die Sets. Ekco depends on Danly Die Sets to save costly tooling time and help maintain uninterrupted production schedules in this highly competitive industry, because Danly Die Sets provide the finest *precision* starting point for diemaking. They are available on short notice from a completely stocked Danly assembly plant nearby.

It's a point worth remembering . . . when the job calls for *precision* performance, *depend on Danly Die Sets!* There's a Danly Branch near you . . . stocked for immediate delivery.



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DIEMAKERS SUPPLIES

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SPOT NEWS of Metalworking

- **General Motors' $1 billion expansion is expected to increase output 20%** in all its auto lines. Expansion money will be apportioned among GM's auto divisions in line with their size, Chevvy getting the most, etc.

- **Aluminum wheels and fans 2 to 4½-in. dia are hot-extruded to finish sizes** at AiResearch Mfg Corp's Phoenix Div. Fans with 10 blades, and bucket wheels with 30 precision buckets are extruded to tolerances of 0.001 at a 100-per-hr rate.

- **Westinghouse's spending of $2 million to re-equip its integral1hp motor plant** at Buffalo has produced these innovations: complete processing of small-size cast iron frames by a single transfer machine; making of laminations in progressive dies. Motors now being made to new NEMA standards are smaller, have an insulation life expectancy three times that of former motors.

Looks like big companies are getting a larger cut of the military prime contracts pie than ever before. At the end of June, 1953, the top 100 companies accounted for 64% of all prime contracts. At June's end 1952, they got only 62.4%; in 1951, 61.2%. General Motors Corp alone accounted for more than 7% of all prime contracts since 1950.

- **ODM steel set-asides for direct defense contractors will be 13% less** next quarter than for the current quarter—with copper 20% less, aluminum 15% less.

- **New aluminum alloy that bridges gap between 61S and higher strength 24S and 14S** has been developed by Harvey Aluminum Corp. Alloy is lightweight, resists corrosion, welds easily, has guaranteed tensile and yield strength 31% over 61S alloy—tensile strength of 50,000, yield strength of 45,000, 8% elongation in thicknesses up to ¼ in.

- **Biggest maintenance base outside Japan in the Far East** will be built by the Armed Forces of the Philippines at a cost of $1.5 million. Work shop will be equipped with heavy machine tools for rebuilding, maintenance and repair of military equipment.

Military prime contractors must soon make detailed materials conservation reports to procurement agencies. Reports must include information on: (1) material conserved, (2) end-item of product involved, (3) conservation measure adapted, and (4) an estimate of the amount of material conserved within the last six months.

- **Management's stress on better working conditions,** on the health of workers and on the good-neighbor policy is bringing a swelling tide of orders to makers of ventilating and dust collecting and treating equipment.

- **Plans of major steel producers to put finishing mills in the Detroit area** are being shelved or looked at more closely as automobile companies reveal programs for decentralizing new plants.

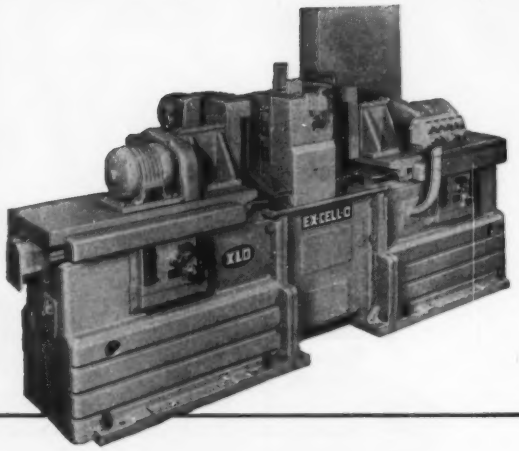
- **Army Ordnance Corps has set up a Production Equipment Records Unit** at Rock Island, Ill, Arsenal to keep a complete inventory of all Ordnance machinery and tools. The inventory will show the machine's location, kind, make, age, capacity, past usage, whether in use or in storage.

- **Twelve Cleveland companies plan larger payrolls this month,** compared with nine cutting back employment. But Cleveland's production workers are down 19,000 from a year ago and the workweek has dropped to 40.1 hours.

822

PIECES PER HOUR

Photo above shows one of the die-cast aluminum workpieces. Arrows point to the bored holes which are held to plus or minus .0005". Four parts are machined during each cycle, netting 822 pieces per hour.



FROM THIS

EX-CELL-O

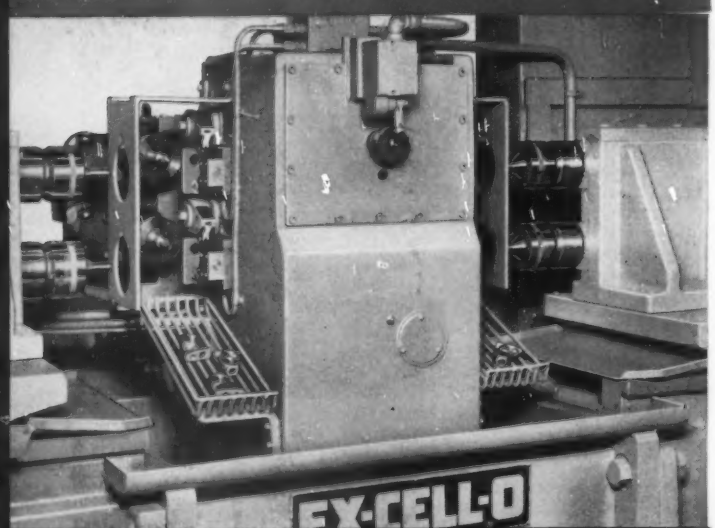
3-Way Machine

Works From 3 Directions Simultaneously

This Ex-Cell-O three-Way Precision Boring Machine consists of three standard, self-contained way units joined to a center section. The left and right way units have two spindles each, mounted one above the other on angle plate brackets. The rear unit carries four spindles, two on each side. The center section supports a fixture accommodating two parts on each side. Work is clamped and ejected hydraulically.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines, or write today for Bulletin 31631.

XLO
EX-CELL-O for PRECISION



Two parts are held in each side of the fixture. Left and right slides bore 13/16" diameter hole through each part, while rear slide is boring 5/16" blind holes at right angles to the others. The work is unclamped and ejected automatically at the end of the machining cycle.

3-22

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

Eisenhower's budget message spells out exactly what kind of government he thinks the Republicans should give the country—spelled out in detail and backed up with more money for this operation, less money for that.

High spots are these: the long list of tax recommendations which Congress is asked to pass in order to stimulate business expansion and keep the country prosperous. Heading the list of these tax concessions: faster amortization on plant and equipment — permission for companies to write off two-thirds of the cost of capital goods in half the useful life. Instead of writing off half the cost in half the life of the equipment in question.

• • •

Other tax concessions are important to many metalworking businesses. Check these: extend one year carry-back of losses to two years, while keeping present five year carry forward; liberalization of Section 102 to make it easier for smaller companies to retain more earnings with paying taxes; a start toward eliminating double-taxation of corporate dividends by giving dividend receivers tax credits for this kind of income; simplify tax rules for partnerships; make it easier for small companies to switch from partnership to corporate form or vice-versa without burden of tax liabilities; and others along this line.

• • •

One big change would require corporations to come closer to a pay-as-you-earn tax basis: under present law, a corporation must pay its tax liability on 1955 earnings in equal installments in March and June of 1956. Under Eisenhower's proposal, payments of 5% of 1955 estimated profits would be due in September and December of 1955—by 1959 payments of 25% of estimated earnings of a tax year would be due at the end of the third and fourth quarters of that year.

• • •

The administration is not asking for new Vance Plan funds for reserve tools and facilities. However, the Pentagon has earmarked for spending in 1955 $100 million of the $250 million fund voted by Congress last year. Nothing has been obligated so far. The Truman administration requested $500 million last year, in accord with the Vance Committee's recommendation. Eisenhower's revised 1954 budget retained this, Congress then cut it in half.

• • •

The budget asks for $56.3 billion appropriations for fiscal 1955, contains a $2.9 billion deficit. That compares with $60.7 billion voted for this year and a $9.9 billion deficit. National security, of course, dominates the budget again—$44.9 billion for Defense Dept programs, mutual aid, atomic energy, stockpiling.

The military budget alone is for $30.9 billion, compared to $34.4 billion voted for fiscal 1954, and puts added emphasis on airpower. But appropiations aren't really the important measure of the defense effort. Actual spending tells the real story—especially since the Pentagon will start fiscal 1955 with $51.6 billion appropriated in prior years but still not spent and $8.5 billion of this not even obligated. Fiscal 1956 will start with $43.8 billion previously appropriated but unspent, according to current estimates. Remember that old appropriations never die.

• • •

Here's the picture on next year's spending. As a whole, there will be a drop from $41.5 billion in fiscal 1954 to $37.5 billion in 1955. The big drop will be in vehicles, ammunition, soft goods, personnel costs, and assorted housekeeping expenses.

• • •

Spending for aircraft and ships will remain at the 1954 level in general, for electronics and guided missiles will rise somewhat. Aircraft procurement will account for 22% of total military spending next year. That compares with 20% this year, 17% in 1953, 13% in 1952. Expenditures by individual services: $16.2 billion by Air Force, $10.4 billion by Navy, $10.1 billion by Army. This year's figures are $15.6 billion, $11.3 billion, and $14.2 billion, respectively.

• • •

The administration claims a new concept for its military plans and financing. In previous years, planning was based on several successive assumed fixed dates of "maximum danger." These were extended from time to time with appropriate changes in procurement and manpower programs to achieve "maximum readiness" by each date.

• • •

The new military budget reflects Eisenhower's own professional thinking. It's designed to provide a strong military position, which can be maintained over the extended period of uneasy peace. The added emphasis on airpower complements plans for improving continental defense against possible enemy attacks. In the President's own words: the administration expects "to continue improved combat effectiveness of forces by use of new weapons and techniques to ultimately achieve far greater flexibility than heretofore attainable."

90mm shells, fully loaded, are final-checked on this world's largest jumbo automatic gage.

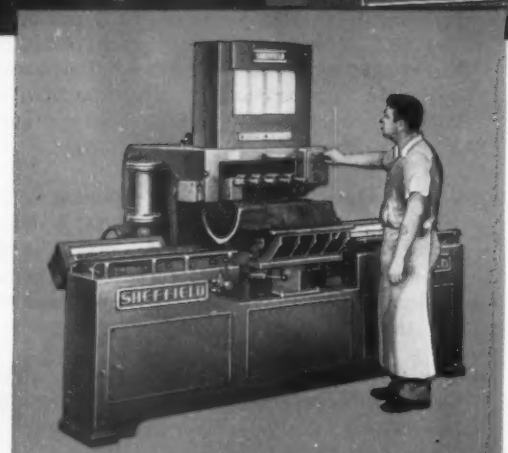
JUMBO GAGES for JUMBO JOBS

Automation in mass production calls for conveyors, machine tools and gaging machines of jumbo size to perform jumbo-size jobs.

Cylinder blocks, crankshafts, camshafts, pistons, rings and pins; push rods, king pins, valve lifters; refrigerator pistons, valve plates and thrust rings; small arms ammunition and artillery shells; roller, pin and ball bearings; jet turbine shafts—these are a few typical jumbo jobs gaged by Sheffield jumbo gages. They indicate how Sheffield helps industry produce greater volume at lower cost—for a more profitable operation.

"The world's foremost authority on production gaging" is a distinction often conferred upon Sheffield by reason of the tremendous volume of such equipment, including jumbo gages, which Sheffield produces.

Sheffield engineers would like to discuss your requirements in every field of gaging. *Gage Division, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.*



Gages weighing tons check four, six or eight cylinder block bores simultaneously and classify them in selections of .0002.

Principal auto makers use huge multi-column Precisionaires for the simultaneous checking of as many as 34 dimensions of a crankshaft.

6297

SHEFFIELD HEADQUARTERS — SHEFFIELD

Detroit

Detroit industrialists knew for several months that big things were stirring in the General Motors kettle.

Nobody seemed to have a firm clue as to the scope of things to come, but a good many people were aware of the nature of planning.

As long ago as September, vague whisperings of construction men sent reporters bird-dogging around the GM building, to no avail. Pulling a shred of information out of Argonaut Realty, the tightly guarded division which has charge of GM's huge real estate holdings (almost 150 plants around the world), is regarded as no less difficult than would be an assignment to ferret out the styling plans of the auto divisions for their 1957 models.

When the corporation issued $300-million of debentures last December, that provided more tangible evidence to chew on.

The announcement that GM is undertaking a $1-billion expansion program solved the immediate riddle. Harlow Curtice, president, estimated that 60% of the program will be completed this year, the remainder by the fall of 1955. That compares with $343 million spent in 1952. Alfred Sloan, Jr., chairman, put it in even larger terms. He figures that expenditure will be nearer $1.5 billion, spread over three years.

• • •

Machine-tool builders, construction firms and GM's myriad suppliers now have new riddles to ponder. Each doubtless is wondering how big a slice of the money might be shunted into his particular field.

There is, of course, no way of determining accurately the direction in which the money will flow. A number of "ifs" enter into estimates simply because GM is so heavily committed to defense production (about 20% of its more than $9-billion sales volume last year stems from military orders), not to mention its wide activities in other manufacturing fields such as home appliances, diesel engines and locomotives, etc.

However, knowledgeable architect-engineers, suppliers and others can provide a fairly accurate rule. The statistics most generally agreed upon are 45% for building construction, 45% for equipment and 10% for tooling.

But if the major part of the program involves additional capacity for automotive production—as Curtice suggested it would—then the tooling expenditure is apt to run closer to 25% of total outlay, with the balance about evenly divided between plant and equipment.

Add to this the normal expenditures the corporation will make for new tools annually (special tools, dies, jigs and fixtures for the 1954 GM models alone cost about $350 million), and the machine tool industry's share of GM spending during the next two years looms large, indeed.

• • •

The surging production-sales drive of Ford, it goes without saying, provided main impetus for GM's expansion. By maintaining overtime schedules in 15 plants, Ford has in recent months been able to keep pace with Chevrolet.

Both producers have been pumping out cars at a 30,000-unit-a-week clip. Chevvy has managed to maintain this prodigious pace without resorting to the overtime schedules Ford has, and in 1953, it out-produced Ford by nearly 300,000 units.

Nevertheless, GM has had no grounds for disregarding the Ford threat, simply because sales, rather than productive capacity, are likely to determine 1954 and 1955 standings. In addition to selling well, Ford, too, leads the industry in automation, and presumably has been reducing its production costs to a point approximating or undercutting those of GM.

To this point, Ford's mammoth post-WWII plant and equipment expenditures have received most attention, but the proposed GM outlay—on top of $2 billion spent for capital investment in the last eight years—over-shadows Ford spending. In the seven years ending with 1952, Ford spent $900 million.

For that amount, Ford got: 7 assembly plants, 13 manufacturing plants, 16 parts depots, 4 engineering buildings and 20 other plants were modernized or enlarged. Additionally, Ford plans to build three more assembly plants, two office buildings, a stamping plant, an engine plant and a manufacturing plant.

What GM plans specifically was not revealed. However, it's expected that for Chevrolet, the program will mean an additional 3-million sq ft of floor space in Michigan and about 2-million sq ft outside Michigan. Chevrolet construction now underway: a forge plant and foundry plant at Tonawanda, NY; an engine plant and stamping and frame plant at Flint; a spring and bumper plant at Livonia.

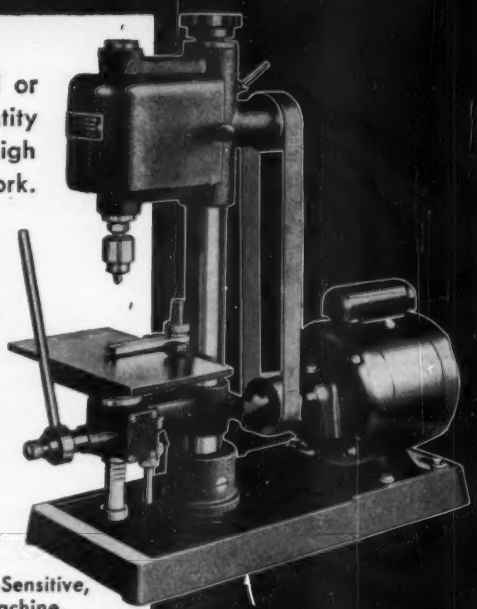
Fisher body will add over 100,000 sq ft to its Flint No 1 plant, 265,000 sq ft to its Grand Rapids plant and 89,000 sq ft to its stamping plant in Pontiac, Mich. It likely will enlarge its stamping plant in Hamilton, O, and its special body plant in Cleveland. Some of GM's new plants may be expected to pattern after its Arlington, Texas, dual-purpose plant (equipped to assemble either or both autos and navy planes). While there have been no recent GM pronouncements on the subject, new plants probably will also embody fully the automation concept so aptly demonstrated by Ford.

YOU CAN DRILL OR TAP TINY, PRECISION HOLES . . . ON A *PRODUCTION* BASIS . . . WITH *MINIMUM* SCRAP AND *MINIMUM* TAP AND DRILL BREAKAGE

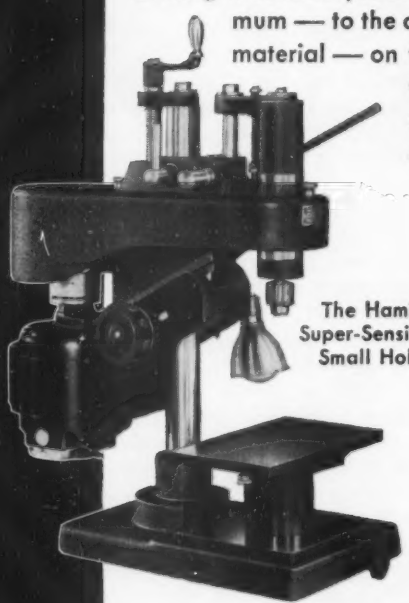
BUT YOU **MUST** FIT THE TOOL TO THE JOB

When your job calls for tiny, precision holes, drilled or tapped, rely on this; such holes can be produced in quantity and within allowed tolerances only on super sensitive, high precision machines **designed and built** for this class of work.

HAMILTON Drilling Machines and Tapping Machines are super sensitive and extra accurate; **designed and built** for the production of tiny, precision holes. The drilling machines produce holes **up to** 0.3125" maximum — to the center of 10" — in **any** drillable material — on fast production schedules. The tapping machine is designed to use the smallest and finest tap and **up to** 10-32 inclusive.



The HAMILTON® Super-Sensitive, Small Hole Tapping Machine.



The Hamilton VARIMATIC® Super-Sensitive, Variable Speed, Small Hole Drilling Machine.

Multiple spindles also . . .

Acquaint yourself with Hamilton Super Sensitive, Small Hole Drilling and Tapping Machines and be ready for the challenge ahead. Ask for our FREE Bulletin DT-5308.

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Machine Tools

Machine tool builders and makers of other production equipment will get a healthy chunk of the $1 billion that General Motors will spend for plant expansion and for modernization.

General Motors officials refuse to say exactly what the amount will be. It is a safe bet, however, that it will run 10% as a minimum ($100 million) and perhaps a lot more than that.

• • •

One point is not clear—whether machines now on order and to be delivered and paid for in 1954 are included in the $1 billion program. A good guess is that they are included.

Even so, a huge buying program is yet to be carried out and many production equipment builders will benefit thereby.

A full account of automotive plans, especially the General Motors project, is on page 85.

• • •

Thompson Products will spend $16 million this year for new plants and modernization of existing plants. A new factory will be built in the Detroit area and another one for Ramsey Corp, Thompson's St Louis subsidiary.

Several million dollars will be invested in new machine tools, automation projects and other improvements in the company's 22 operating divisions. The automation projects will supplant line production.

• • •

Some 29 top-flight executives of machine tool companies and other builders of production equipment met in Washington on January 26 for an all-day session at the Carlton Hotel.

Secretary of Commerce Weeks extended the invitation and personally appeared before the group.

A number of subjects close to the hearts of the metalworking equipment industry were discussed. Examples: Foreign trade, taxes, management of idle government-owned equipment, speedier depreciation of machinery, renegotiation, and so-called post-attack planning.

This meeting, because it did not involve any official government body such as an industry advisory committee, was held outside government offices and was very informal in character.

• • •

Ralph Cross, executive vice president of the Cross Co, Detroit, has taken over for a six-months' period the duties as director of the Metalworking Equipment Division of the Business and Defense Advisory Administration of the Commerce Department.

He succeeds Perrin March III, president of the Cincinnati Shaper Co, who has been in this key post since June 1953 and who also has been serving the past few months as assistant administrator of BDSA.

The 1954 Leipzig Fair is set for September 5-15, immediately preceding the fourth European Machine Tool Exhibition at Milan, Italy, September 14-23.

Covered stand area at Leipzig is to be increased to 160,000 sq meters. The open area also is being enlarged to show products of the mining and heavy machinery industries of the German Democratic Republic (East Germany).

A press release from Leipzig says that leading firms in western Europe are asking for extensive exhibit space because "they are highly interested in the development of their trade relations with the eastern world."

• • •

Kearney & Trecker has made public a program of leasing its standard machine tools under three plans each of which runs for a period of seven years.

The customer has the option of purchasing the machine or terminating the lease at the end of a specified time or at any time thereafter during the life of the lease.

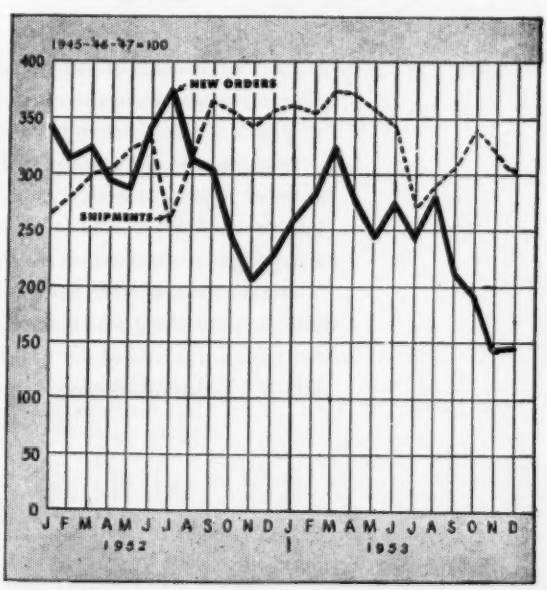
For full story on this tool-lease program, please turn to page 140.

BF

MACHINE TOOL INDEX

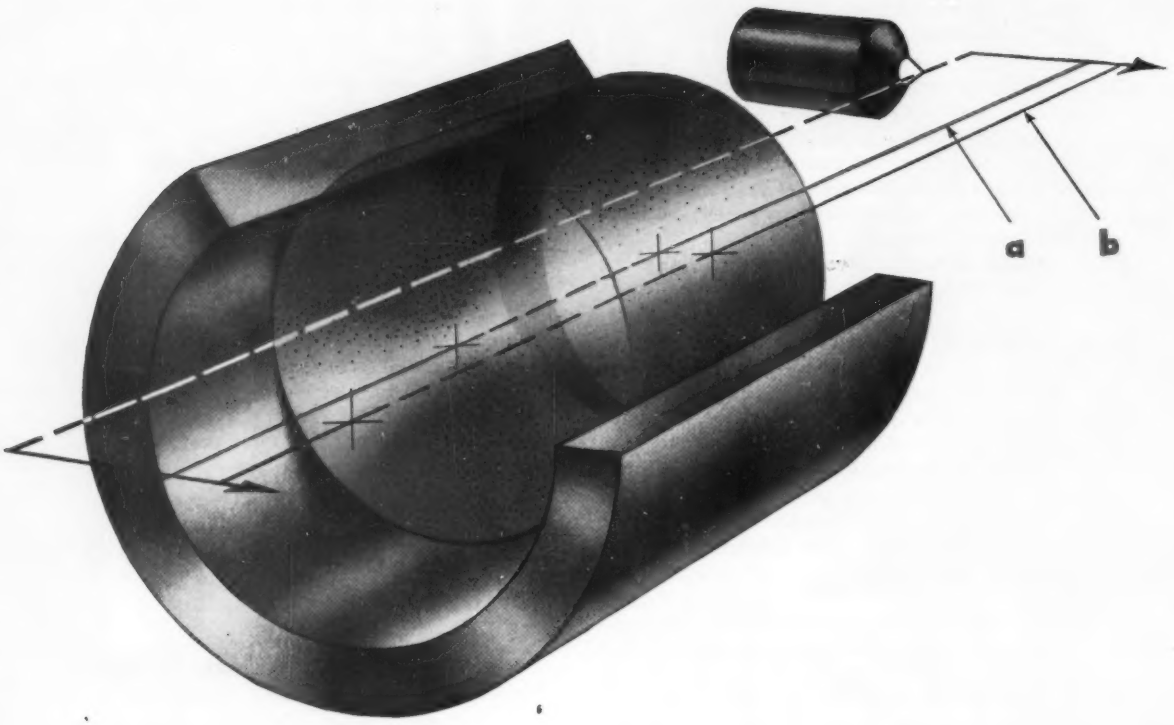
(1945-47 = 100)

(Source: National Machine Tool Builders' Assn.)



alignment

for better internal grinding

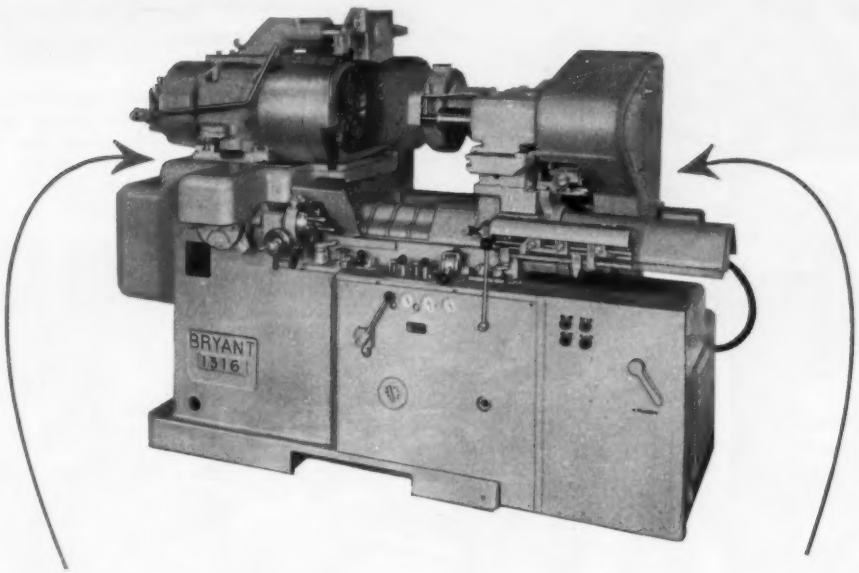


THE heart of the internal grinding process is the line of contact between the wheel and the work. This contact line must be straight for the full length of the wheel and the full length of work as the wheel traverses. If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.

Several elements contribute to the straightness of this line of contact: first, the path along which the wheel is traversed "a" must be a straight line; second, the axis of the wheel must lie in a plane parallel to the wheel path "a", and third, the axis of the work "b" must be parallel to the wheel

path "a". For production grinding, the diamond must lie in the plane established by the wheel axis and the work axis.

Perfect alignment means that the slides must be straight and true, the wheel and work spindles must be in line and "zeroed" for center heights and the diamond must be on "dead center" of the wheel. A full, straight line of contact will extend wheel life, improve wheel action, and will assure correct geometry and required finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with the wheel path.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

The Bryant 1316 hydraulic internal grinder is specially adapted for parts on which two or more grinding operations are to be performed at one chucking. This machine is made in several types suitable for such jobs as grinding bore and face where squareness is critical, or inside and outside diameters where concentricity is important. Straight and tapered holes in parts up to 16" diameter can be ground to a depth of 8 or 9". The workhead may be swiveled for grinding tapers up to 90° included angle. Stable 3-point support is provided under the wheelslide. The workslide moves on four anti-friction bearings spaced to give maximum support. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Co.

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Pacific Fittings Division
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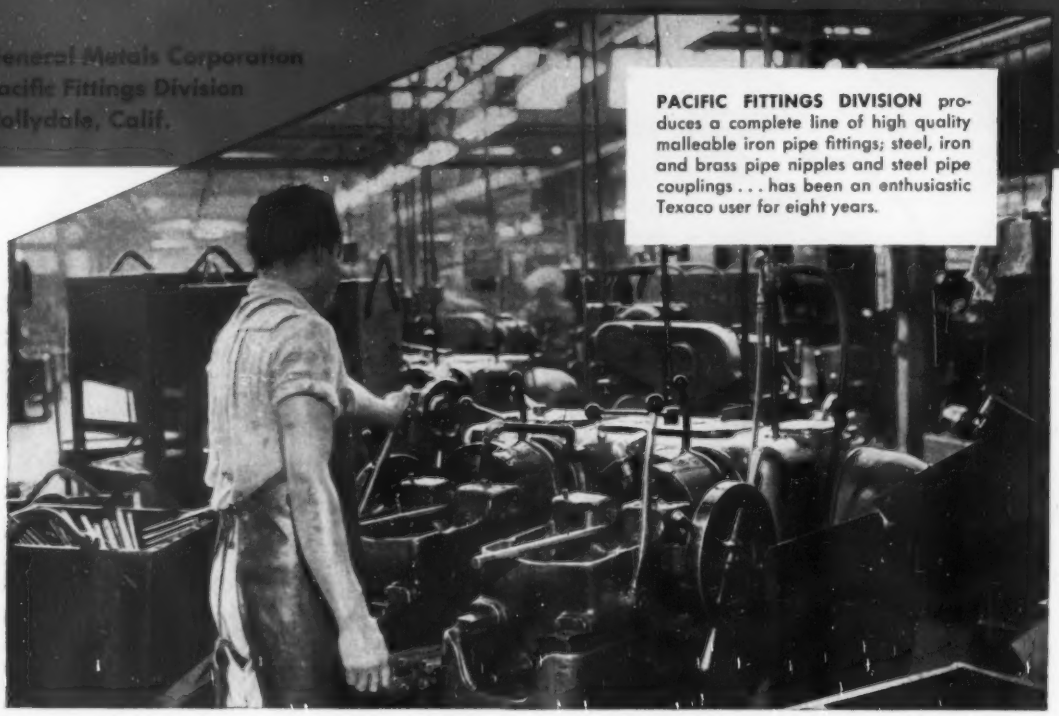

PACIFIC FITTINGS DIVISION produces a complete line of high quality malleable iron pipe fittings; steel, iron and brass pipe nipples and steel pipe couplings . . . has been an enthusiastic Texaco user for eight years.

PACIFIC FITTINGS DIVISION of General Metals Corporation—largest pipe fitting manufacturer on the Pacific Coast—has this to say about Texaco Products and Service:

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There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. And Texaco Lubrication Engineering Service will gladly guide you in their selection and proper use. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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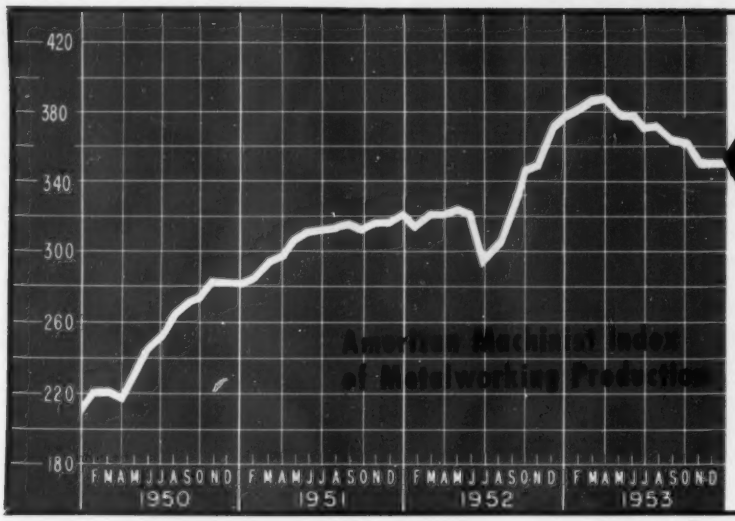
TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	DEC '53 (*)	NOV '53 (p)	OCT '53 (r)	NOV '52
Tot. Index	**349**	**349**	**352**	**372**
Machinery	317	315	320	
Electrical Machinery	399	407	424	
Autos	271	274	292	
Other Transportation	578	576	592	
Other Metalworking	342	349	371	

(*) Estimated (p) preliminary (r) revised

Metalworking operations showed up better in January than anticipated.

The further slippage in production that was so widely talked about did not occur, if preliminary estimates prove correct.

American Machinist Index of Metalworking Production stayed up at 349 (1939 = 100). That is the same level as in December.

• • •

Output today, based on manhours worked, is down only 9% from the postwar peak of last spring.

It still is 3½ times what it was just prior to World War II.

Chances are that the present high operating rate will hold the next 30 days.

• • •

Many manufacturers are confident that they will be able to attain the same volume this quarter as in the fourth quarter of 1953.

Had it not been for the fact that automobile production did not live up to its advance billing, January's performance would have outstripped December's.

Steel bookings in January were considerably below expectations. February mill production won't much more than match January's rate.

March will see the real test of what's to happen to steel production through the first half.

• • •

One thing is sure: Automobile makers had stocks of steel much larger than imagined. These tonnages are being worked off before more orders are placed.

Non-automotive steel users too are using up what they've got before authorizing mills to ship.

Steel warehouses are well stocked with all kinds of steel except possibly wide flange beams.

The upsurge of orders for nickel alloy steels, expected as a result of the government's removal of restrictions on nickel, has failed to develop.

• • •

Both the stamping and screw machine products industries are feeling the adverse effects of the shift of big customers toward drawing work into their own "captive" shops as business tapers. Result: Only 75% operating rate among independent stampers, who will be lucky to hold to that level unless automotive or appliance customers come through with a lot of new business.

Orders that were counted upon to be placed in January did not come through.

Much of the current production in stamping plants is against backlogs which are rapidly dwindling.

• • •

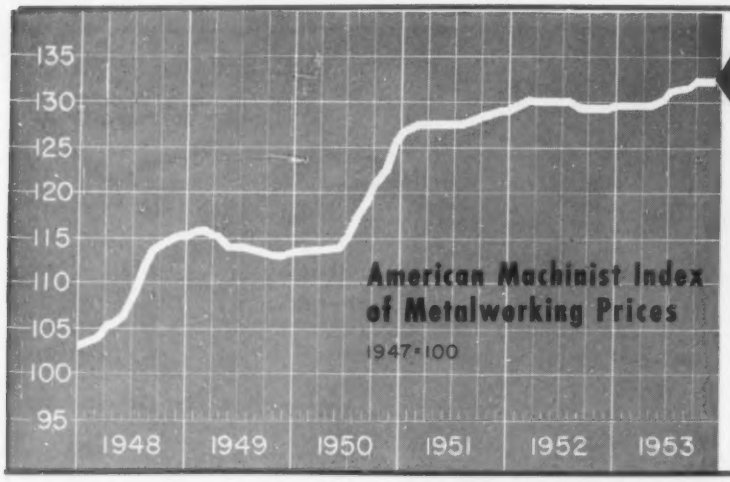
There is a flurry of activity in sheet metal shops making such items as office and factory wall partitions and dust-collecting and air purification systems. Many manufacturers in these fields are running at or near capacity and have comfortable order books.

• • •

Aircraft parts makers have not changed their pace since the fourth quarter, though they have been pulling in subcontract work from outside.

They feel that their schedules, now about 10-15% below the first quarter of 1953, will stay where they are until midyear. By then they believe that fresh orders will be ready from plane manufacturers.

Gaging Business



PRICE INDEX

132.6

	DEC '53(*)	NOV '53(p)	OCT '53(r)	NOV '52
Total Index	**132.6**	**132.6**	**132.6**	**129.7**
Metalworking Machinery	**141.8**	**141.8**	**137.8**	
Other Machinery exc. Electrical	**137.3**	**137.3**	**132.3**	
Electrical Machinery	**131.9**	**131.8**	**124.5**	
Fabricated Metal Products	**129.0**	**128.9**	**128.2**	

(*) Estimated (p) preliminary (r) revised

Despite metalworking production declines, metalworking prices are firm—have even risen a little in the last two months.

And other industrial prices have kept pace with metalworking prices.

• • •

December retail sales totaled $16.6 billion, and after seasonal adjustment, were about 1% below November sales.

Even so, retailers weren't too unhappy about the drop—this was the second best December on their books.

Auto output for 1954 is running way under the industry's forecasts. January's production of about 460,000 passenger cars doesn't even approach earlier industry estimates of 550,000 units for the month.

And many auto companies are laying off production workers just when they should be turning out a high volume of cars.

Low auto output is affecting the steel industry, 20% of whose tonnage has been going into automobiles. So far this year, automotive companies have been cutting down their own steel inventories.

But they'll be looking for steel shortly, the steel companies insist.

Another big steel consumer, the railroad industry, hasn't placed any big orders this year.

• • •

Housing starts topped 1.1 million units in 1953, with December starts totaling 68,000.

The outlook for 1954 housing: one million starts.

• • •

Non-Agricultural employment increased 300,000 between November and December. This was the smallest November-December increase reported in recent years.

Factory employment declined 270,000 during the period, but this was offset by an increase of 500,000 seasonal retail workers.

December's weekly pay averaged $71.78—18 cents more than in November, but 36 cents below December 1952's all-time high.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	123.7	126.4	134.0
Steel ingot operation (thousands of tons)	1,772	1,772	2,248
Electric power output (million Kilowatt hours)	9,014	8,825	8,121
Production of automobiles and trucks	149,852	152,418	148,049
Engineering construction awards (*Eng. News-Record*—millions)	$173.5	$195.8	$229.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-49 = 100)*	128	130	133
Index of durable manufactures production (1947-49 = 100)*	144	147	152
Durable goods manufacturers' sales, millions*	$12,098	$12,376	$12,361
Electrical machinery manufacturers' sales, millions*	$1,361	$1,391	$1,300
Other machinery manufacturers' sales, millions*	$2,074	$2,039	$2,111
Durable goods manufacturers' new orders, millions	$9,697	$9,677	$11,549
Electrical machinery manufacturers' new orders, millions	$ 900	$1,039	$1,273
General machinery manufacturers' new orders, millions	$1,723	$1,798	$1,874

* Seasonally adjusted. Now based on new (1947-49 = 100) Federal Reserve Index

T-J

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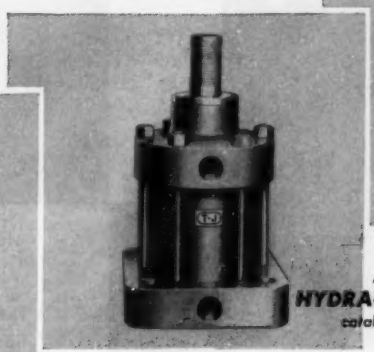
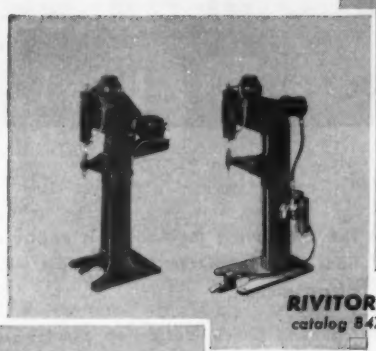


AIR AND HYDRAULIC CYLINDERS
catalogs 43 and H-47



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- It is small, compact and sturdy enough to withstand rough handling in the shop.

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6277

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

The Boys from Syracuse Point the Way

This is no time in Metalworking for the timid soul. Bold action instead should be the order of the day. The boom is over and the competitive fight is on.

Merely trying to hold onto what you have may prove disastrous. Much better to redesign your product or to come up with a new one which may replace or supplement your present line. And what about strengthening your organization all down the line?

Look at what manufacturers in Syracuse, N Y are doing: Easy Washing Machine Corp is now producing a new clothes dryer which, together with Easy's automatic washer, make a "matched pair."

Smith-Corona has a new "88" office typewriter on the market and is developing an electric typewriter for introduction this year. U S Hoffman Machinery has a new line of dry-cleaning and laundry machines which is more than two-thirds in production.

Porter-Cable has designed a number of new portable electric tools for industrial and homecraft use that will be offered in 1954 "by aggressive merchandising methods." Kane & Roach are enlarging and improving their roll department (making sheet-metal machinery) and are increasing their sales force 50%.

Engelberg Huller Co has taken over the abrasive-belt grinders of Porter-Cable and is building a national sales organization. Meanwhile it has designed a complete plant for cleaning and curing coffee beans.

Aircooled Motors Inc has been working on a new engine for military applications other than aircraft to be introduced about midyear. The management reports that it "is resetting its sights to step up efficiency and lower costs."

Stone Machinery Co has two models of high-speed cutting machines on the designer's board. They will be added shortly to the seven already being sold.

Carrier Corp reports that "the current evolution of new products and methods, such as synthetics of all types, together with high precision and virtually automatic manufacturing operations, has created an even stronger need for air conditioning as a processing device."

General Electric's Electronics Division began pilot production in January of a 15-in. color TV tube. It has greatly improved monochrome picture tubes. It also is building high-power uhf transmitting equipment for which the sale will be lively. Late in 1954, GE expects a trend away from all-out production of standardized radar field equipment toward "advanced forms of electronic apparatus."

The Manufacturers Association of Syracuse sums up the situation by saying that "realistic optimism" rules. The need is recognized for greater emphasis on cost, price reduction and production efficiency. This ties in directly with the heavy emphasis currently being put on sales and engineering.

From this recital of what is happening in one metalworking city you get a clear idea of one thing: The boys from Syracuse are not sitting on their hands bemoaning the sliding off of business. They are taking positive action to see that the slippage is slight and painless.

If the story in other cities is anything like that in Syracuse, there is cause to cheer. 1954 promises to be a good year in Metalworking.

Burnham Finney

50 lbs. oil pressure

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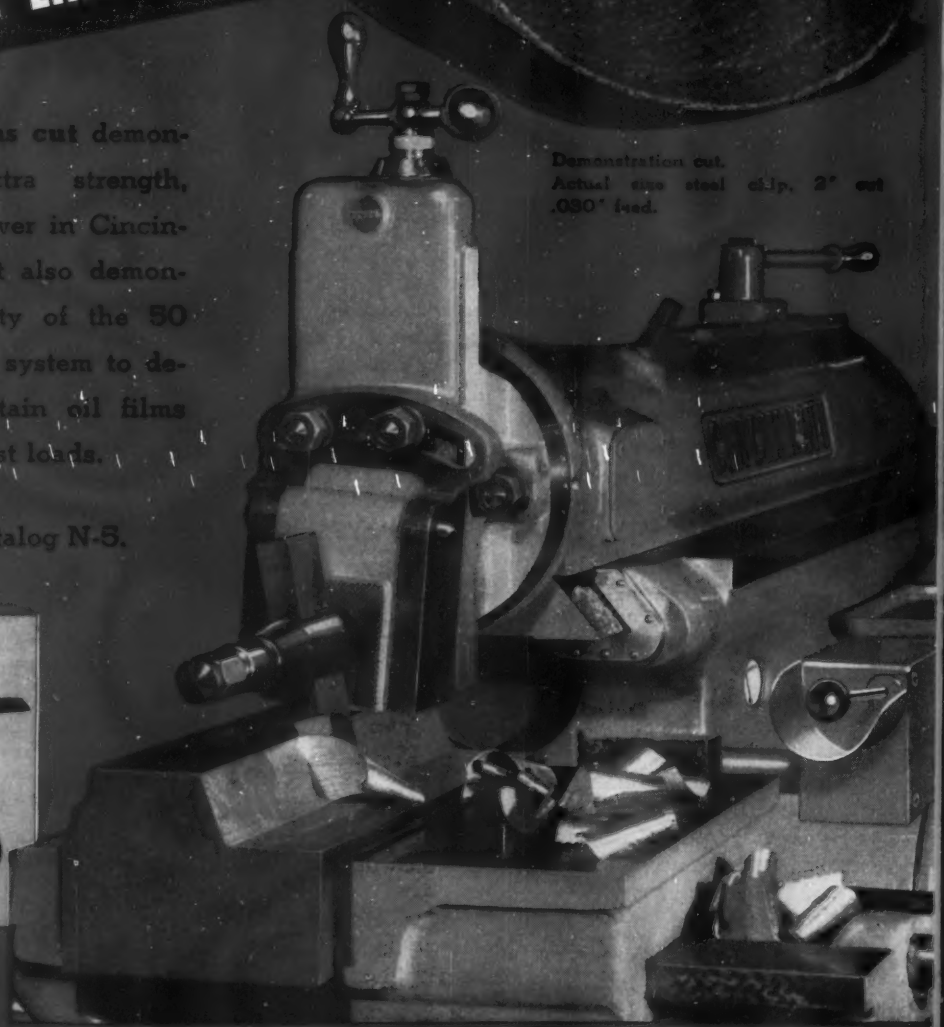
Demonstration cut. Actual size steel chip. 2" cut .080" feed.

This tremendous cut demonstrates the extra strength, rigidity, and power in Cincinnati Shapers. It also demonstrates the ability of the 50 p.s.i. lubrication system to develop and maintain oil films under the heaviest loads.

Write for Catalog N-5.

50 p.s.i. system includes 50 micro filter, settling basin and reservoir. Transmission runs submerged in oil.



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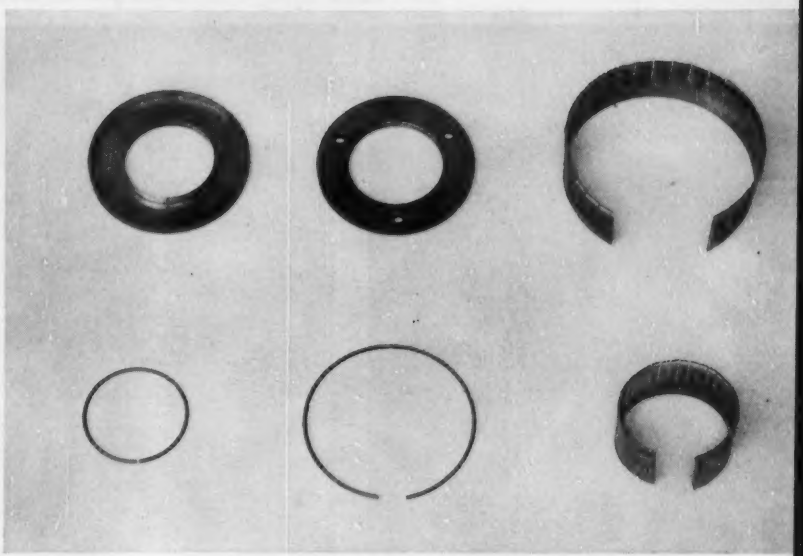
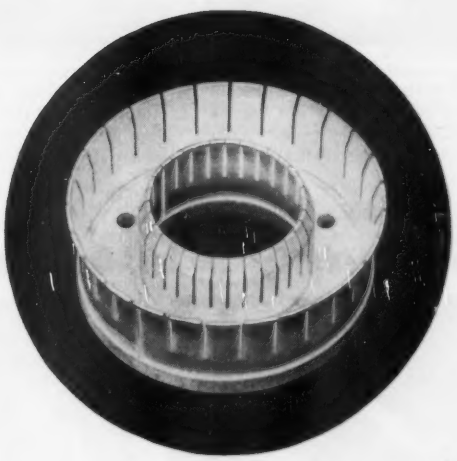


MAJOR ELEMENTS of the "short" assembly include two brass disks formed with mating flanges, two contact-finger rings of strip, and two solder preforms. But the contact fingers are themselves unusual assemblies, as later pictures show



uhf...

Contacts formed four times faster

By CORWIN S SELBY,
Asst Production Manager,
THE HEWLETT-PACKARD COMPANY,
PALO ALTO, CALIF

Beryllium-copper "shorts" for electronic oscillators were formerly hogged out of solid slugs at Hewlett-Packard. Cost was high, life short. Solid silver overlaid on finger ends lengthened life, but added to cost. Now a completely new process has been developed to cut fabrication time 80% and improve wear life and electrical characteristics.

HERE IS THE NEW PROCESS—IN PICTURES...

strips of beryllium copper are rolled up, and

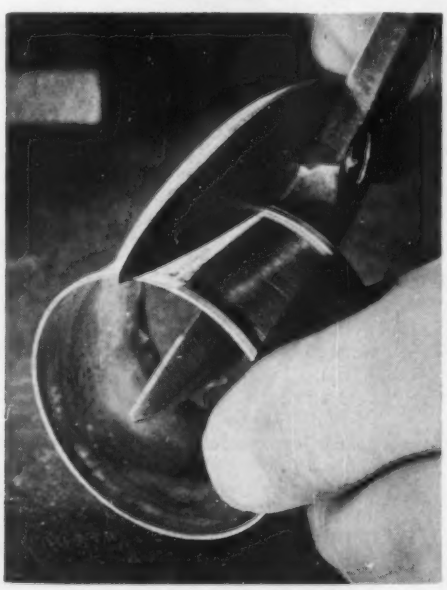
1 Beryllium-copper strip, 1½ x 0.006 in., is rolled into a cylinder to give a rigid shape over which silver-wire rings (90% Ag, 10% Cu) may be slipped for soldering. Silver wire could not be soldered to a flat strip of beryllium copper without buckling

2 Square cross-section silver-wire-rings are cut from 1/16-in.-thick tube and sized on a tapered mandrel. They will become overlays bonded on ends of contact fingers for longer life and better contact

3 A silver ring is placed over the beryllium-copper cylinder, then the two set over a brass ring (left hand), set above center to draw heat away from the bottom of the assembly in the furnace and even the melt

. . . then soldered rings are cut, flattened out, and slotted

6 Brass collar is knocked out with a series of short, sharp blows. The driving tool is recessed slightly to create a shoulder that rests on the silver ring. A plastic hammer is used to avoid peening over the driving tool

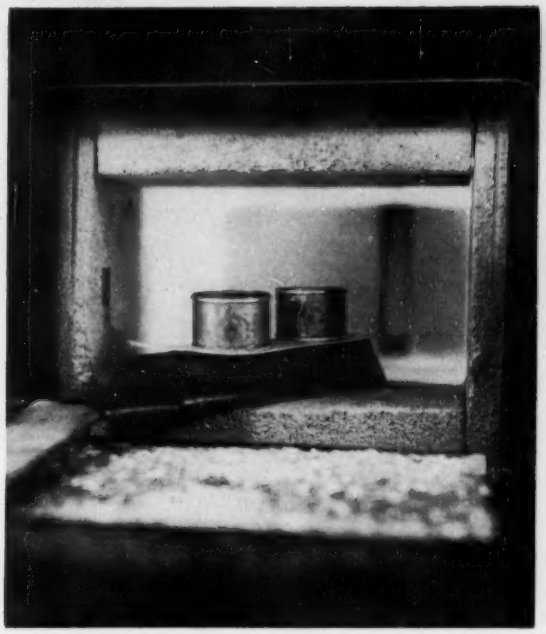


7 Silver rings are snipped through at the joint in the cylinder. This can be done accurately enough with tin snips because ends will be squared later anyway

8 Split assemblies are rolled out flat on a steel plate with a section of bar in preparation for the slitting operation

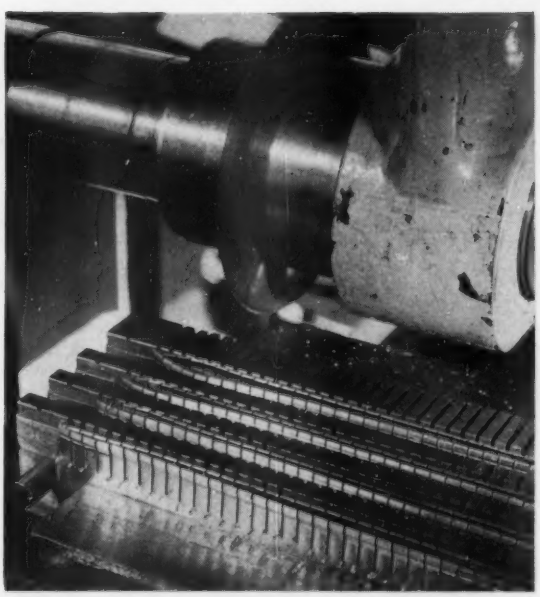
contact surfaces soldered on as silver rings cut from tube . . .

4 Silver rings are placed roughly to hold the assembly, flux-coated, the rings placed precisely, and silver-solder preforms positioned with the rings and fluxed. This assures thorough fluxing under the rings—vital if the solder is to fill the whole joint. The assembly is set upright on an asbestos pad to retard melting of the lower solder ring

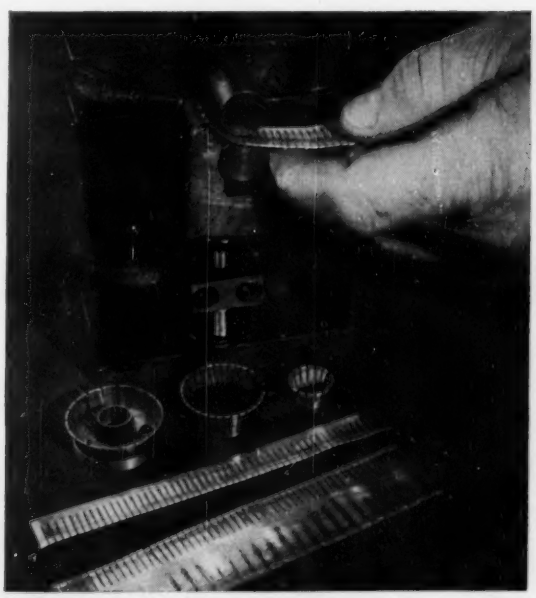


5 Assemblies are brazed, two at a time, in a furnace at 1450 F. Brazing requires about 60 sec, and the assemblies are quenched at once to anneal them

to create contact fingers on both edges



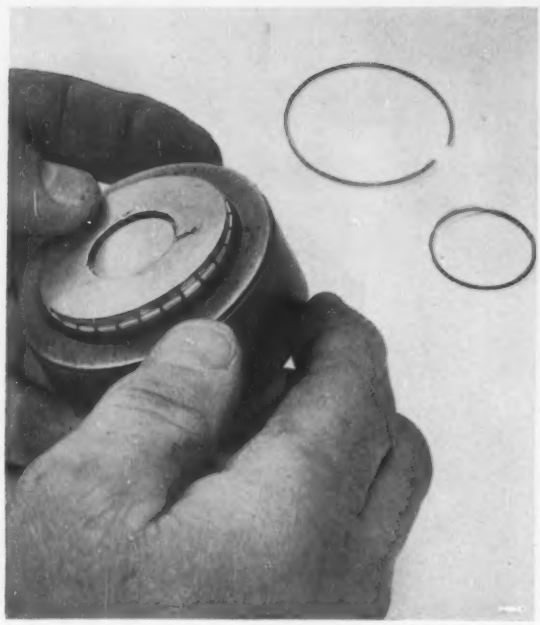
9 Eight strips are grouped, in pairs, in a packing fixture and slotted with a saw on a horizontal mill. Fixture bars (lower left) are slotted top and bottom so the fixture can be inverted in the vise for slotting strips on both edges



10 Strips are cut longitudinally, then rerolled into a circle in this adjustable fixture. Various shapes of contacts (center) can be made from the basic strip (bottom). Note cone shape of contact

(Continued on next page)

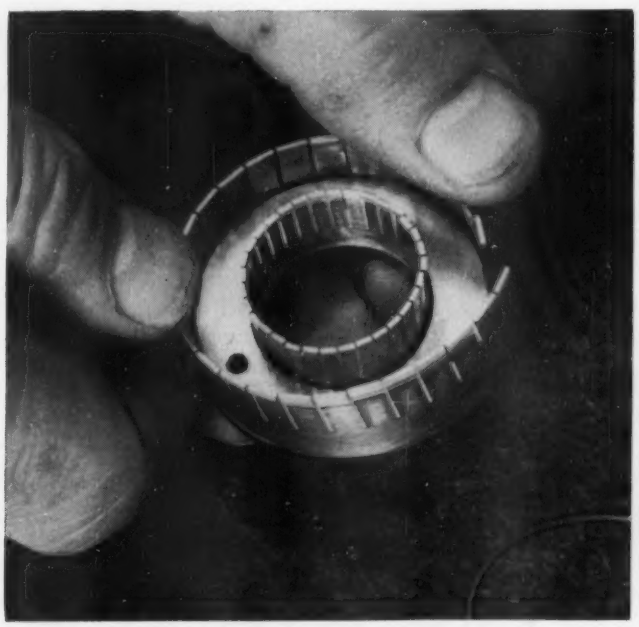
. . . finger tips are shaped, the rings tempered, and



11 Fingertips are bent outward in an arbor press, using this die—a cone within a tapered ring. Forcing the cone down spreads the fingers outward. Contacts then are degreased in vapors of hot trichlorethylene, destained if necessary by placing in 10% sulphuric acid from 15 min. to an hour. This weak solution cleans slowly without etching the metal

12 Hardening, for spring action, is done with the contact ring in a die to hold shape accurately. This assembly is put in an 8-in.-dia x 6-in. stainless steel pot with a center stud through the lid to hold it down. In the base of the pot is a copper preheating coil through which an inert gas (95% N, 5% H_2) is fed at 10 liters per min. to wash out air, then the lid is sealed and gas is fed in at 1 to 2 liters/min., bleeding out through a 1/32-in. hole in the lid. Gas is fed through a flexible copper tube so the pot can be placed in an electric oven at 600 F. About 30 min. are required to reach temperature, 2½ to 3 hr for hardening, depending upon hardness desired and size of contact. The pot is then removed and allowed to cool for 5 to 10 min. with the gas flowing. Cooling can be hurried by a wet cloth on the outside

15 Fluxed parts are assembled as shown on the inner contact ring. The lower disk fits over the upper one, so one solder ring fills this joint and also attaches the outer contact ring



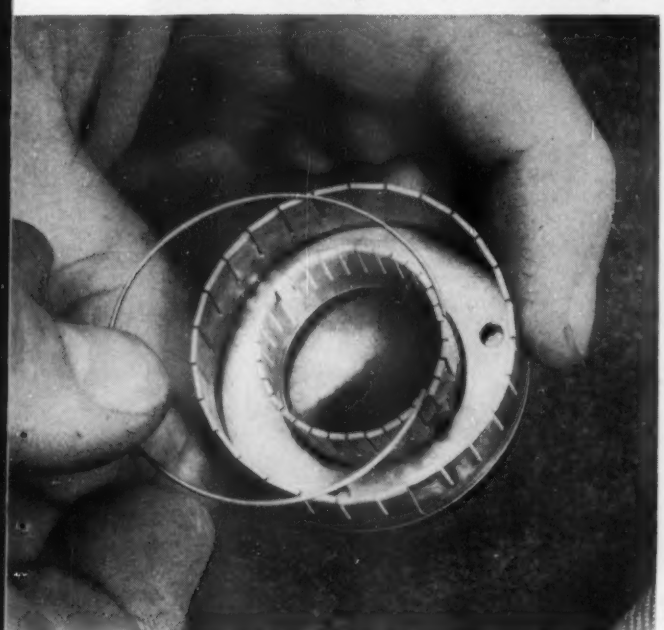
16 The outer contact ring is snapped on the assembly and held by one of the solid base rings at right. Location is not critical because the fingers simply contact walls of a wave guide

parts are flux-coated for final assembly by brazing

13 Hardened inner and outer contact rings are flux-coated as are the two brass disks on which they are assembled and the soft-solder preforms. Here the outer ring is being flux-coated

14 The disk surfaces are also coated where solder is to flow. This is the lower disk. Note that the upper has three holes, by which the assemlby is operated in service as well as during lapping

. . . final assembly involves solder preforms and holding rings

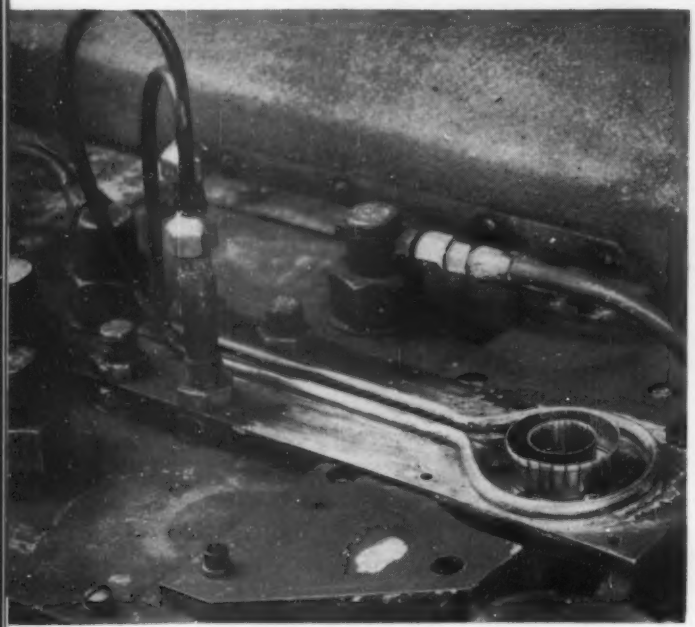


17 Solder preforms are placed inside at the joints of contact rings and upper disk. Soft solder is used for this assembly so previous brazing is not affected.

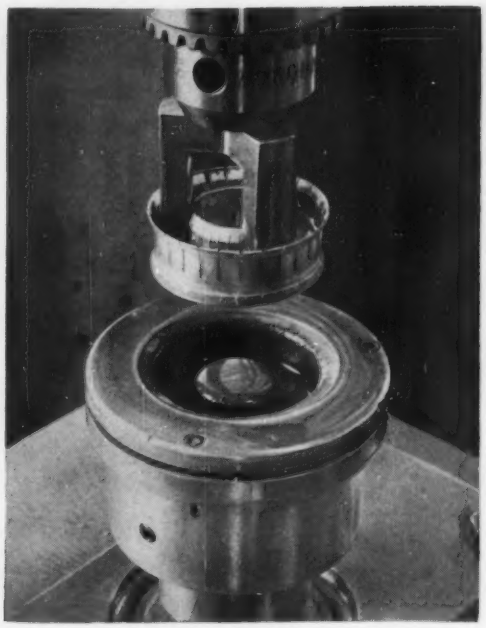
18 Disks are brought to the base and square with the rings by placing a collar over and tapping with a plastic hammer on a level surface

(Continued on next page)

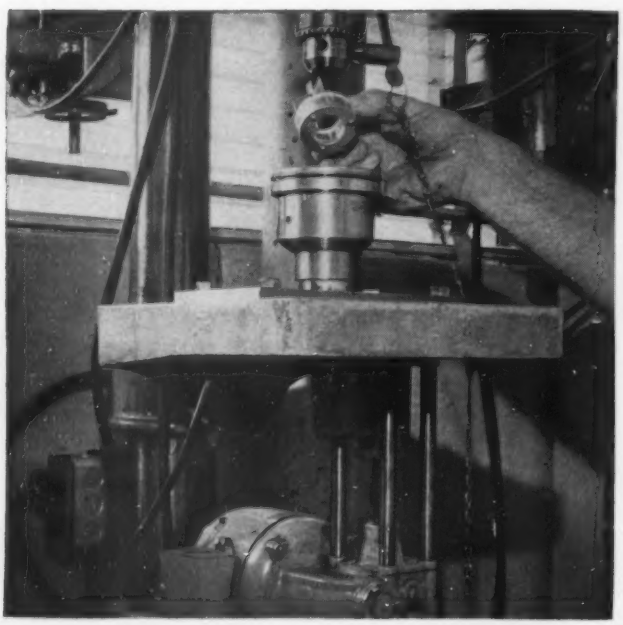
. . . final brazing and honing in a special setup finish the "short"



19 The assembly is placed in an induction heating coil and brought to 450 F only in the zone of the disk to avoid flowing of silver on fingertips. Soldering takes only 20 to 30 sec, but is critical because of the soldered fingers; if heat reaches the tips, current is kicked off momentarily for cooling

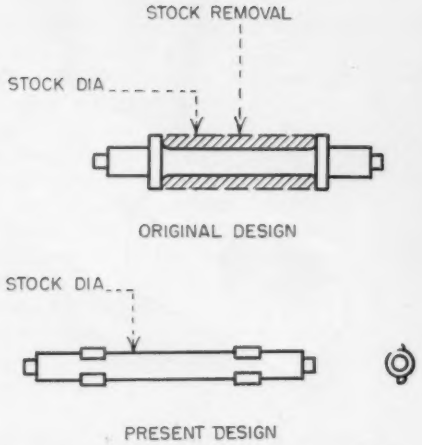


20 Contact assemblies must be honed to bring the silver fingertips to circular shape. The assembly is held on a spider by bolts through the baseplate holes, and the spider gripped in a drillpress chuck and rotated at 32 rpm in a honing fixture built into the table

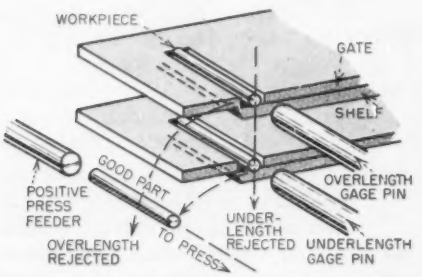


21 A Delta drillpress rotates the spider while the fixture reciprocates vertically at 172 times per min. Reciprocation is produced by a Boston ratio motor operating a Sears & Roebuck adapter that ordinarily converts a portable drill into a saw. Outer stones are 0.004 to 0.006 in. smaller in ID than the OD of the fingers, inner stones the opposite, so fingers are compressed for accurate honing

22 Honing (Alundum A60-R5UBE) takes about 4 min., the spindle rotating for 2 min. each way. This triple exposure shows the action. Lard oil and kerosene lubricate and float off silver particles. Hand lapping with Bon Ami (formerly done) took 15 to 20 min., frequently resulted in damaged fingers, and gave rounded surfaces with poor contact

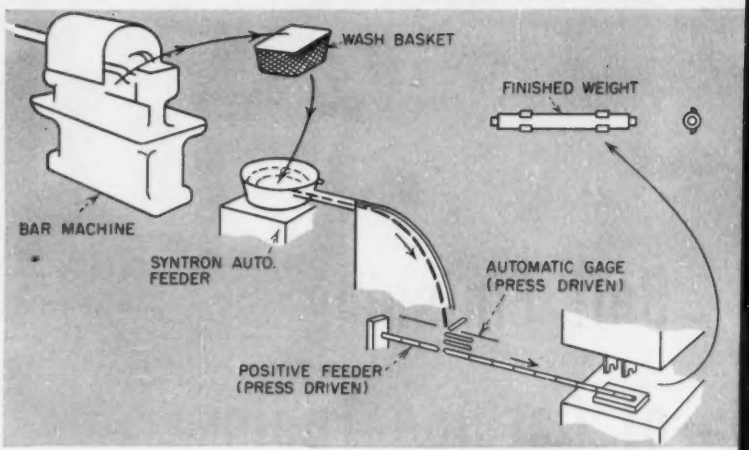


WORKPIECE MUST BE HELD to accurate weight and length so the motor will work properly. Old method, turning ¼-in. bar stock, led to undesirable weight variations, excess stock removal, and wasted machining time. By redesigning the part slightly, the part is made of ⅛-in. stock, with press-embossed tabs instead of shoulders. Now only machining is to form a slight neck at each end of bar during cut-off

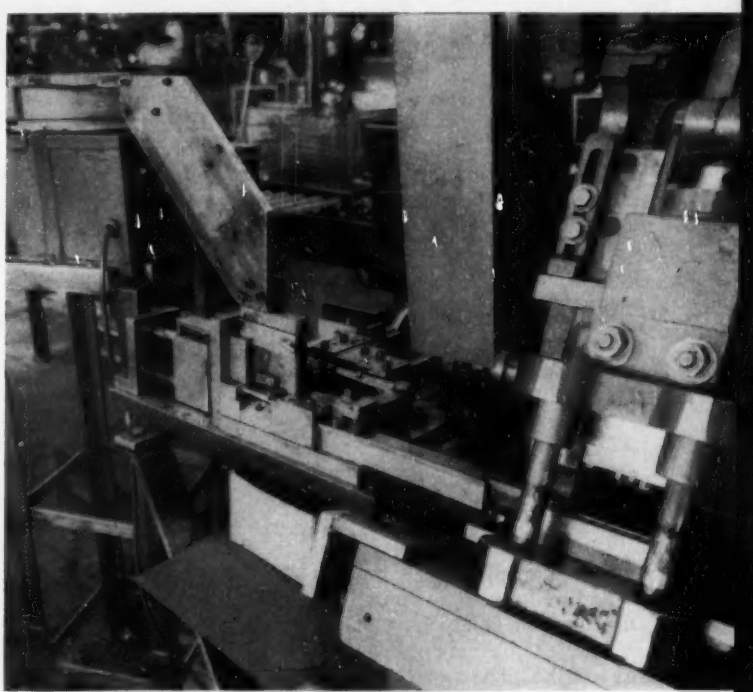


NOVEL GAGE has two sections. At upper level, oversized parts are held by upper gage pin, pushed out of cycle. Good and undersized parts drop through to lower level, where undersized parts drop through gage because they are not held by gage pin. Good parts move in front of press-driven positive feeder. Because there is little variation in weight with new method, size is satisfactory measure of weight

VIBRATORY PRESS FEEDER (upper left) moves parts to gage, from which they are moved directly to embossing press, where tabs are formed



WITH NEW METHOD, operator is saved trouble of selecting parts for press, because gaging and feeding are automatic. Oversize and undersize parts are rejected by gage

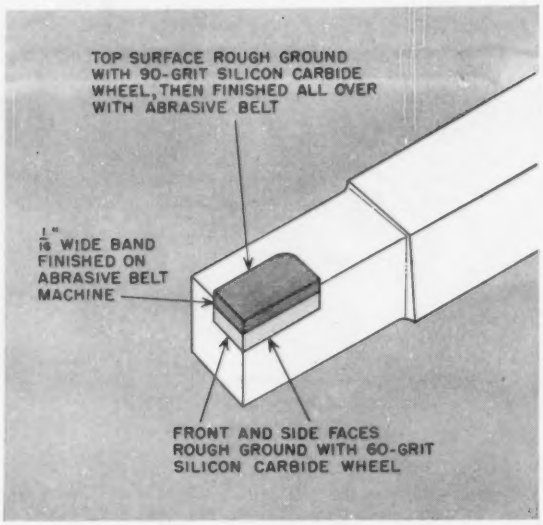


A Little Design Change Saved a Lot of Money

Novel 100% gaging and a slight design change cut machining time 69% and stock requirements 75% in making governor weights for Small Motor Div of Westinghouse

By C M MODD, Manufacturing Engr, WESTINGHOUSE ELECTRIC CORP, LIMA, OHIO

Belt Finishing of Carbide Tools Proves Effective


TOP SURFACE ROUGH GROUND WITH 90-GRIT SILICON CARBIDE WHEEL, THEN FINISHED ALL OVER WITH ABRASIVE BELT
1/16" WIDE BAND FINISHED ON ABRASIVE BELT MACHINE
FRONT AND SIDE FACES ROUGH GROUND WITH 60-GRIT SILICON CARBIDE WHEEL

PROPER PROCEDURE for belt-finishing carbide-tipped tool. Roughing operations with silicon-carbide wheels are completed before silicon-carbide belt operations are started

Finish grinding of carbide-tipped tools with special abrasive-belt grinders is a suitable alternate to diamond wheels in times of emergency

By F J LENNON, Jr general superintendent KENNAMETAL INC

Of the substitute methods for grinding carbide-tipped tools that have been tried during the recent shortage of diamond wheels, silicon-carbide abrasive belts are the most promising. This has been made possible by the development of two belt grinders that have largely overcome the previous difficulty with rounded edges caused by whipping of the rapidly moving belts and by laps in the belts.

Diamond-wheel finishing seems at this stage to be more economical. However, the abrasive belt method is new, and the unit cost per tool may be reduced as improvements in belts and machines are developed.

Of real importance is the fact that we now have another carbide-tool finishing method available to all users. This assures that carbide tools can still be used economically even if the supply of diamond bort were to be drastically reduced or eliminated. It is desirable that the new method be properly field tested and evaluated to determine its practical limitations for carbide tool sharpening.

TESTS OF METHOD

First of the new machines, developed jointly by Behr-Manning Corp, Troy, NY, and Fenlind Engineering Co, Rockford, Ill (*AM*—Dec 8 '52, p 102), uses 4-in.-wide, 54-in.-long, cloth- or paper-backed silicon-carbide abrasive belts over a 16-in.-dia flat-face, cast-iron wheel. This machine can be used only for finishing front and side edges of the toolbit, vertical adjustment of the table providing variation in clearance angles.

The second machine, announced by Minnesota Mining & Mfg Co, St Paul, Minn, and Hammond Machinery Builders, Inc, Kalamazoo, Mich (*AM* — May 11 '53, p212) passes the same size and type of belt over a short vertical platen closely mounted between two small pulleys. The top face of the tool, as well as the front and side edges, can be finished with this machine. A conventional tilting table can be adjusted to produce the required clearance angles.

Kennametal secured one of the first machines of each type and has been carrying on extensive tests in their tool-grinding department.

At the start of the tests there was a natural skepticism as to the possibilities of the method. Previous tests with conventional belt grinders, in which the belt passed over long platens between widely spaced pulleys, had not produced satisfactory cutting edges. The new series of tests soon demonstrated that if proper care is used when performing finishing operations, satisfactory cutting edges can be produced. Furthermore, tools finished with properly selected belts will give good service in the field.

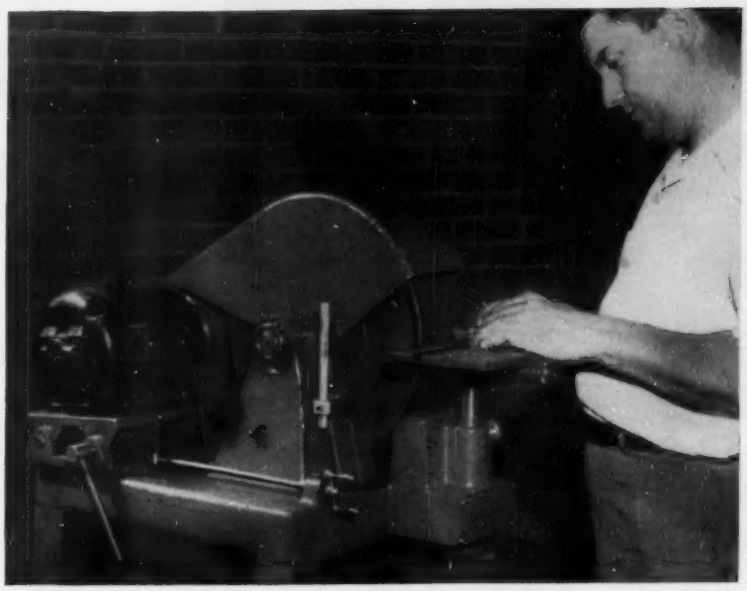
The new belt machines are not expensive (approx $500), and belt cost per tool finished is not excessive. Average belt cost is approx 50¢, and as many as 20 tools can be finished with each belt. Changing of belts can be accomplished in only a few seconds on either machine. Several belt manufacturers are investigating belt design and manufacturing methods,

and we logically can expect improvement in belt life per tool.

Belt finishing is not satisfactory when a considerable amount of carbide must be removed. Where carbide-tipped tools are to be resharpened, the rough grinding operations still have to be performed with silicon - carbide grinding wheels—with practices currently standard in most tool grinding departments. Then the belt grinder can be used in place of the diamond-wheel grinder for finishing.

With the belt process for finishing, we rough grind the front and side faces of single point tools with a 60-grit silicon-carbide wheel flooded with a proper coolant, forming clearance angles 1° greater than required for the finished tools. Each tool then is finished with the correct side- and front-cutting-edge clearance angles on the silicon-carbide belt, forming a finished land about 1/16 in. wide around the tool (see sketch).

Where the top face of the tool can be finished on the belt machine (now possible only on the Hammond machine), the top surface is rough ground with a 90-grit silicon-carbide wheel flooded with a coolant, then finished with a belt. Using a 90-grit wheel instead of a 60-grit wheel for roughing the top surface of the carbide bit results in a surface that can be finished faster with the belt, resulting in longer belt life.

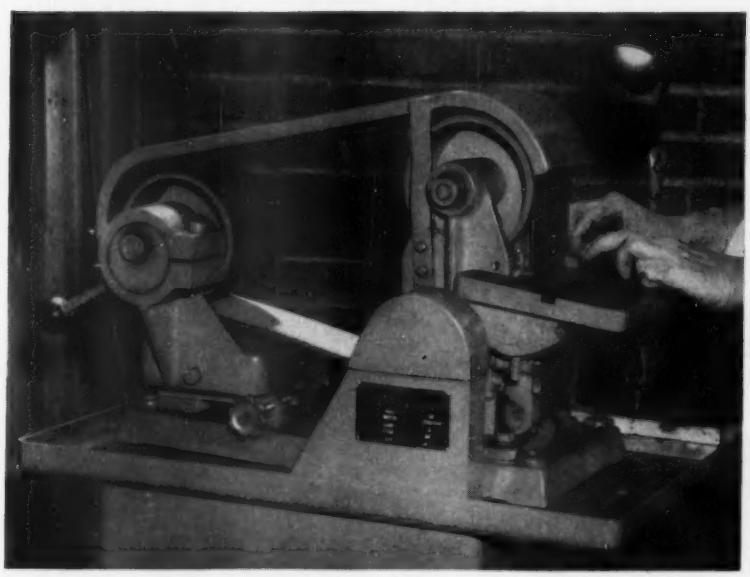


FENLIND DRY-BELT GRINDER used in tests provides constant belt speed of approx 2320 sfpm Table is adjusted vertically to vary angle of narrow clearance land ground around front and side faces, and nose radius of carbide-tipped tool

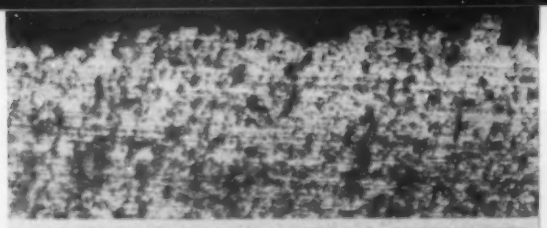
Proper grit size for the abrasive belt depends on the surface quality required on the finished tool. The finer the grit used, the finer the finish obtained—but the shorter the belt life.

The accompanying 100X photomicrographs provide a good measure of the quality of cutting edge that can be obtained with various belt grit sizes. It will be noted that the cutting edge progressively improves in going from the 60-grit belt to the 150-grit belt.

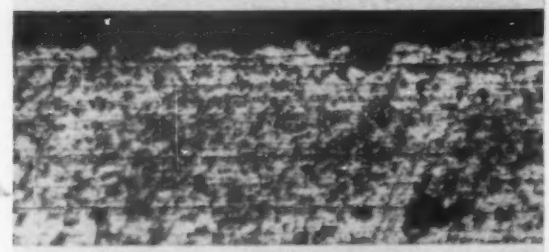
For most applications, we believe that belt grit sizes from 120 to 150 will be satisfactory. This is borne out by checking the photomicrographs of carbide tool edges finished with various grit sizes on the abrasive-belt machines with the photomicrographs of tool edges finished with a 120-grit silicon-carbide wheel and with a 120-grit diamond wheel. Stick lubricants were used for the belt-finishing operations, since they insured cooler cutting and improved finishes. The tools finished with silicon-carbide and diamond wheels were flooded with a liquid coolant as previously recommended (*AM*—Feb 16 '53, p165). While a liquid coolant can be employed with the Hammond belt grinder, no tests have been made as yet on the suitability of this machine for wet grinding car-



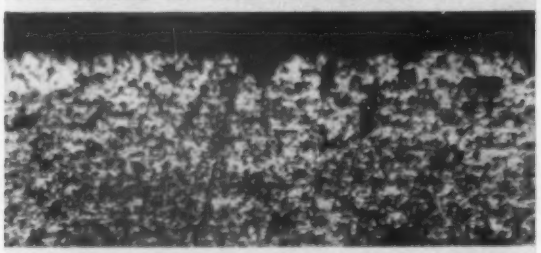
DESIGNED FOR SILICON-CARBIDE BELT FINISHING of top faces, as well as a narrow clearance land around front and side faces, and nose radius of carbide-tipped single-point tool, Hammond grinder has a carbide-faced platen mounted closely between two small flat pulleys. Belt speeds are adjustable



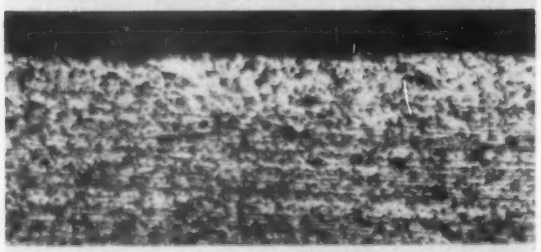
60-GRIT SILICON CARBIDE ABRASIVE BELT



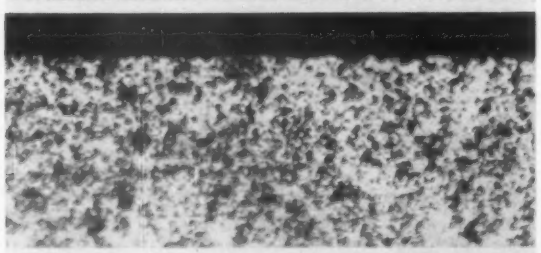
80-GRIT SILICON CARBIDE ABRASIVE BELT



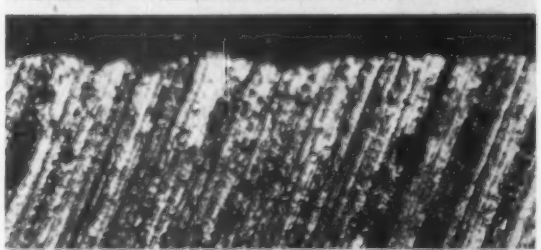
100-GRIT SILICON CARBIDE ABRASIVE BELT



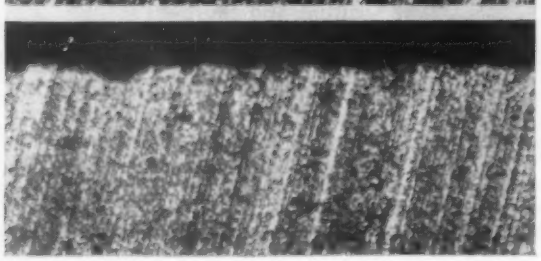
120-GRIT SILICON CARBIDE ABRASIVE BELT



150-GRIT SILICON CARBIDE ABRASIVE BELT



120-GRIT SILICON CARBIDE CUP WHEEL



120-GRIT DIAMOND CUP WHEEL

PHOTOMICROGRAPHS at 100X compare cutting-edge quality of carbide-tipped tools finished with silicon-carbide belts ranging from 60 to 150 grit size, and with 120-grit diamond and silicon-carbide cup-type grinding wheels. In each case, the tool was rough ground with a 60-grit silicon-carbide wheel

bide tools, as suitable waterproof abrasive belts for this machine have not been available.

In studying the accompanying photomicrographs, it should be noted that the cutting edge obtained when grinding dry with a 120-grit abrasive belt is superior to that produced when grinding wet with a 120-grit silicon carbide wheel, and that it closely approaches that produced when grinding wet with a 120-grit diamond wheel.

Early tests on the Fenlind machine showed that for most machining operations, 150-grit belts provide satisfactory cutting edges. Finer grit sizes had a tendency to round the cutting edges, and although they did produce smoother tool faces, it was extremely difficult to produce high-quality cutting edges with the finer belts. There were some indications that higher belt speeds might be desirable, but since the Fenlind machine provides a fixed belt speed, the original belt speed of approx 2320 sfpm was used throughout our tests with this machine.

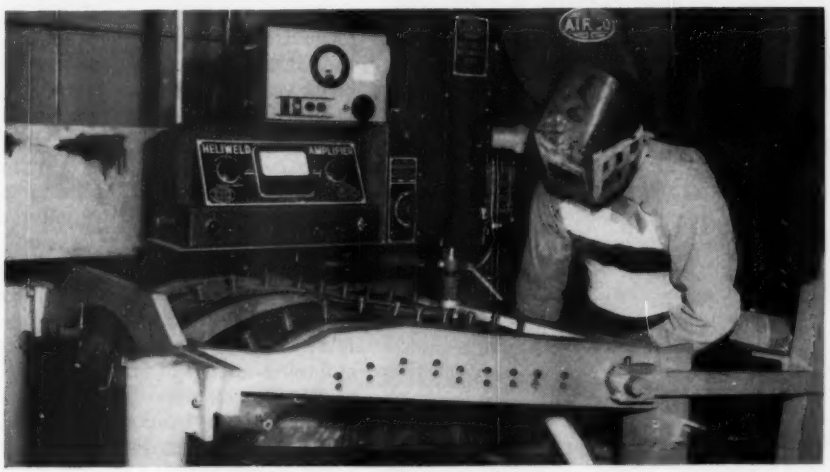
When the Hammond machine was introduced, at a later date, we found that its design makes possible the use of belt speeds up to 5400 sfpm. Subsequent tests with this machine showed conclusively that the higher belt speeds are an important factor in increasing belt life and improving finish obtained. After test-sharpening hundreds of carbide-tipped single-point tools, it was concluded that belt speeds of 4000 to 4500 sfpm provide the optimum in belt life and surface finish. The cutting edges obtained with a 120-grit belt at these speeds were as good as those previously obtained with a 150-grit belt at 2320 sfpm.

At the slower belt speed, there

was considerable difference in the quality of the edge produced on the first tool finished as compared with that on the last tool finished with a given belt. As the speed was increased, this condition became less apparent, and at the highest speeds virtually disappeared. All of the surfaces shown in the accompanying photomicrographs were finished at belt speeds of 4000 to 4500 sfpm.

Further evaluation of stick lubricants for dry belt grinding, and of different types of belts for both dry and wet grinding must be done before specific recommendations can be developed. At present, however, we believe sufficient work has been done to prove that silicon-carbide belt grinding procedures can be used satisfactorily if diamond grinding wheels are not available.

Our tests show that for a given grit size, better finishes are obtained when using silicon-carbide belts than when using conventional silicon-carbide wheels for the same operations. Also, less operator skill is required when using the belt than in wheel grinding, since wheel wear and wheel dressing are eliminated. Abrasive dust is virtually eliminated when using the belt method.



AUTOMATIC CONTOUR WELDER employs Airco Heliweld unit and Linde side-beam rolling carriage. Arc length is maintained constant, regardless of rise and fall of work

Contour Welding Performed Automatically

Newest production tool at Ryan Aeronautical Co is an automatic inert-gas-shielded arc welding machine which welds around corners and over irregular surfaces. The electrode follows the peaks and valleys of the contour with greater precision than human hands could achieve.

The operator simply clamps the irregular part, such as a stainless steel afterburner nozzle, in the machine and trips a few buttons. The welding head moves along the seam, rising or falling with every irregularity in contour, maintaining a constant arc, and making uniformly perfect weld deposits.

The machine is composed of three major assemblies. Airco welding equipment performs the welding. Outstanding feature of this equipment is its floating electrode head. It is electrically controlled to respond immediately to changes in arc voltage. Two small electric motors run continuously to raise or lower the head whenever the arc is lengthened or shortened —which occurs as it passes over irregular contours.

The welding equipment is mounted on a Linde side-beam carriage which rolls back and forth on bearing rollers attached to a horizontal 12 × ¾-in. steel plate. An electric motor drives the carriage assembly through a gear and rack on the rear of the plate, and an electronic control eliminates any variations in predetermined speed.

Ryan plant engineers have mounted the entire setup on a steel frame attached to threaded shafts inserted in vertical columns. By push-button control, the operator actuates another electric motor which turns the threaded shafts to raise or lower the entire assembly. An adjustment of between 2 and 5 ft from the floor can be made.

For each production part, Ryan builds a steel jig which secures the assembly with pneumatic clamps. The jigs are designed with a counterbalanced side frame, which swings up to allow correct positioning of the part. After the component is welded, a locking member is opened and the part is pulled out at the end.

Such structures as afterburner nozzles and the General Electric D-17 exhaust cones are typical, irregular-contoured parts welded in the new tool. Welding speeds as high as 100 ipm, three times as fast as manual heliarc welding, are attained on the new device.

VERSATILE PRODUCER...THE PRESS BRAKE...III

THINK OF PRESS BRAKES

Adequate tooling, special-purpose or universal, will make you profits from full-time use of your press brakes. Here are some jobs, tooled both ways, so that you can see potential savings in operations and labor

By J M MATTHEWMAN,
Works Manager, James Smart Plant,
CANADA FOUNDRIES & FORGINGS, LTD,
BROCKVILLE, ONT

The metal fabricator—particularly in small jobbing shops—often faces the problem of justifying the purchase of a press brake. Frequently he wants to obtain profitable subcontract work that cannot be attempted without a press brake, yet that one job will not assure an "earned-return" on the machine's cost. Because he is not familiar with the modern press brake or with the variety of work now possible through recently designed accessories and tooling, he may miss a chance to make a potentially profitable investment.

In my experience as a process consultant, the initial job seldom justifies the installation of a power-press brake *adequately equipped* for a versatile range of production work. But the prospective user should look beyond the first job. One recent instance illustrates the hazard of under-rating the adaptability of these machines. A manufacturer of all-steel furnaces incased in sheet-steel cabinets found that casing sections could not be formed in any press equipment then in his plant. He considered a press brake as an unavoidable expenditure. By taking the view that the machine could serve no other purpose, he specified the minimum equipment available, expecting to see it standing idle most of the time.

RESULTS OF A SURVEY

Fortunately, the press-brake maker's representatives were allowed to study many other metal stamping and forming jobs in that plant. The results are, today, that the machine is busy full time. In addition to the part-time work that could not be handled by any other machine, several jobs of piercing, notching, embossing and forming have been changed from individual punch presses to cost-saving progressive setups.

HE GOT THE JOB

The cost of this dual-purpose press brake with variable-speed drive, angle plates, micrometer ram adjustment, interlocking safety controls and selected standard tools —along with a working capacity double that originally specified— was $7,600, more than a "minimum requirement" machine. This particular unit was in service only two months, when a heavy-volume job came along that could not have been secured without having the accessory equipment and the over-capacity recommended by the maker for this installation. The "necessary evil" then became the "How did we ever get along without it?" machine.

This case, because it is typical, indicates the benefits possible by observing unusual jobs developed

FIG. 1—Die has a simple clearance fit, and the embossed part is removed with an air hose *Dreis & Krump Mfg Co*

BEYOND THE FIRST JOB

for press brakes by users throughout the United States and Canada. Typical savings accomplished by press-brake users are:

TRACTOR PART:

The cost of two machining operations on drawbars for International Farmall tractors was reduced from $25.26 per hundred to $2.24 by changing the method to punching in a Cincinnati press brake. This 900-ton unit is fitted with hydraulic strippers and is tooled to punch 13 holes and 2 slots in ⅝ in. SAE 1045 HR steel plate. Interchangeable dies handle two types of drawbars with minimum delay.

STRUCTURAL STEEL:

Substantial cost reductions per piece have been affected in punching structural channels ranging from 3 to 8 in. and angles up to 5 × 5 in. This entire range of work is handled with two sets of quick-change punching blocks. Accurate location of punched holes also results in a major saving in assembly costs. Former total job time was 5.0 hr. Present total time is 1.1 hr.

AIRCRAFT PART:

Flanged ducts, ranging from 3 in. dia to 6 x 7 in. elliptical section, and from 5 to 7 ft in length, were produced in a press brake without setup interruption. Material was No. 52/S sheet stock in gages from 0.020 to 0.051 in. Savings were 5 to 6 min. per workpiece.

EMBOSSING & FLANGE DRAW:

The standard press brake shown in Fig. 1 is fitted with a die to emboss the center section of the workpiece and to draw-flange the outer rim in one stroke. Both the die holder and the punch holder are reinforced by angle braces and are keyed to be clamped into a standard ram and bed rail.

PLEASE TURN THE PAGE . . .

FIG. 2—Operator uses three strokes to form first half of tube for shell shipping container, the job is reversed during two idle strokes, and four more strokes complete the forming

FIG. 3—One stroke is lost while helper removes piece and operator picks up another blank

Dreis & Krump Mfg Co

FORMING CYLINDRICAL SHAPES:

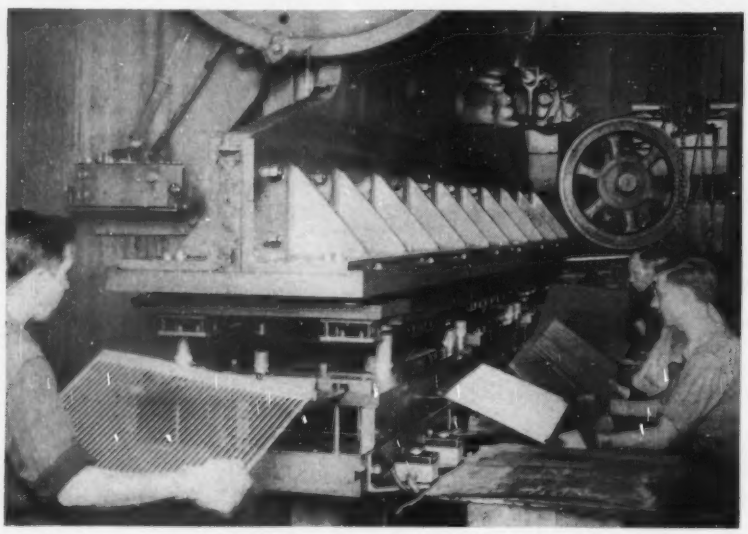
An 18-ga steel-tube shipping container for artillery shells is approximately 7 in. in dia by 50 in. long. By using progressive strokes, this part is formed at a higher speed on a simple set of dies than would be possible using any other equipment except a continuous roll-forming machine.

Working at full capacity, this operator produces five tubes per minute using seven press strokes to complete the part. This press brake runs continuously at 50 strokes per min., and the operator is able to catch 35 out of every 50 strokes. Method of running the job is shown in Figs. 2 and 3.

VENTILATOR PANELS:

The multiple-tooling layout shown in Figs. 4 and 5 is a good example of arranging progressive operations in piercing and forming dies. This set up of special-purpose dies is in contrast to job layouts using standard piercing and notching units in various work patterns. (See *AM*—Jan. 4, 1954, p 96).

The total lineal inches pierced and formed to develop the louvres in this ventilator panel require heavy tonnage capacity exerted over an exceptionally large working area. The tooling engineer has divided the work load among three piercing and forming dies and located the hole-punching operation under a ram extension at the left end. It is important to remember that the rated work-load capacity of a press brake must be equalized between both pitmans and their crankshafts. A press brake will perform work located under one of its pitmans, if such an undesirable setup cannot be avoided, but only up to *one-half* of its rated capacity. Where a piercing and forming load exceeding one-half of the press brake's rated capacity is developed in a relatively small die unit, such a job should be located midway between the pitmans.



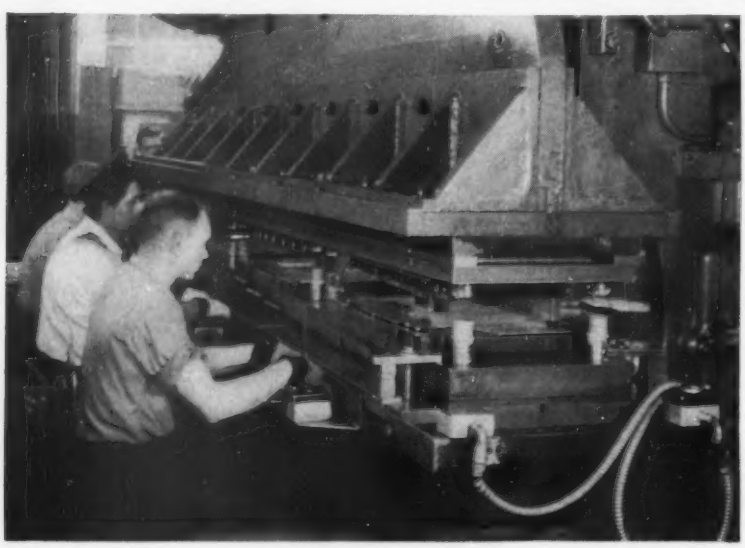


FIG. 4—Hole punching, the last operation, is done on ventilator panels under a ram extension at the left end . . . FIG. 5—Interlocking safety controls improve production up to 25%, because operators must all have both hands on individual controls to trip brake; they lose fear of a fast pace

Cincinnati Shaper Co

GAGE SHOWS LOAD

One of the most essential accessories on a press brake being used for a variety of stamping and forming jobs is a "Tonnage Indicator" or "Strain Gage." This instrument —shown at the right-hand edge of Fig. 5—is built into the main side frame at a location where stresses occur. Its dial shows the working load in tons and is also marked in "Normal," "Caution" and "Danger" areas. These load readings are particularly valuable during development of new job setups, in warning of overload resulting from dull tools, and in prolonging the original accuracy of the bed-to-ram alignment.

Some fabricators think of a press brake as a machine for making straight-line bends in sheet metal, others believe that the machine must be huge. Of course, press brakes are built in standard models having a working capacity of 900 tons and weighing 100 tons, but there are many others that range down to almost portable size. One maker lists 60 standard models, plus a wide range of adaptations. The small units have the versatile features of their big brothers, par-

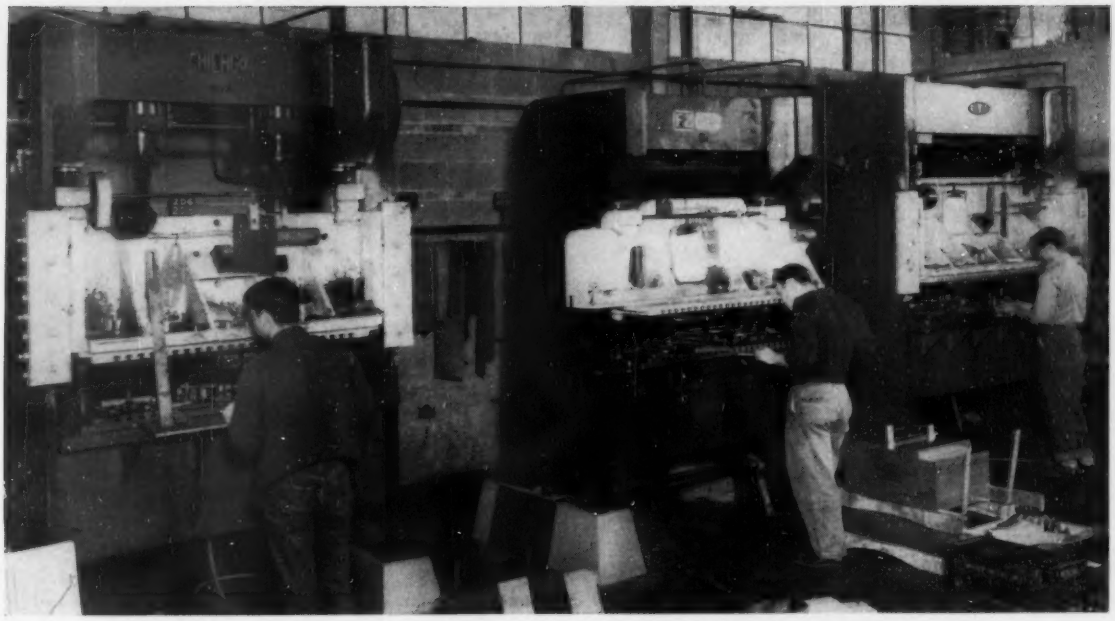


FIG. 6—Small press brakes set at convenient working height, and provided with universal tooling, enable a variety of short-run jobs to be produced with minimum downtime for setup *Dreis & Krump Mfg Co*

ticularly in being readily convertible from straight-line bending to a general stamping and forming work.

REFRIGERATOR PARTS:

The Hussman Refrigerator Company's St Louis plant uses "Chicago" press brakes for piercing, notching and forming a variety of parts. Note the concrete bases, Fig. 6, to position these machines at a convenient working level for the operator. The tooling permits a high degree of flexibility in changing from one short-run job to another. Universal tools in these setups may be rearranged on the T-slot die sets to handle hundreds of different work patterns. The one-piece type universal tools may also be set up on a strip templet keyed into the press bed rail (Fig. 7). Spare tools and standard die sets or templets can be prepared for the next scheduled job and thereby reduce downtime for changes to a matter of minutes.

The fabricator whose work is principally in light-gage metal of relatively large area should compare the small press brake with punch presses of equal capacity and bed area in terms of original cost and adaptability.

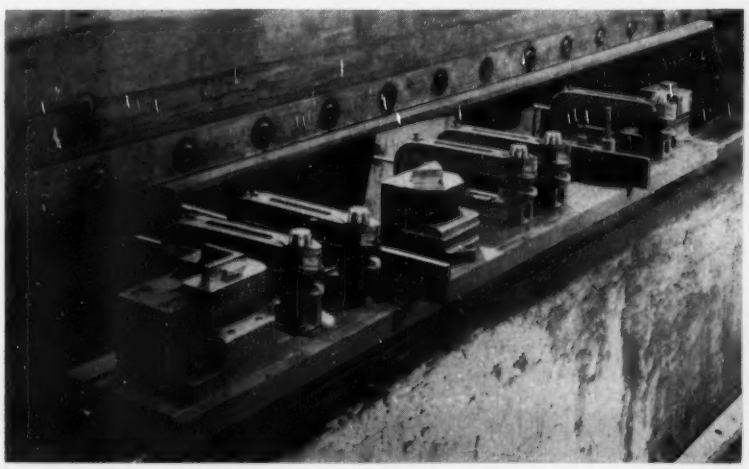


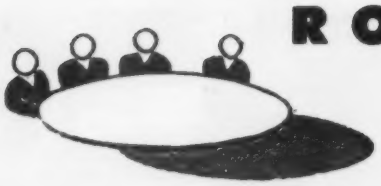
FIG. 7—Universal notching and piercing tools may be set up on a strip templet keyed into the press-bed rail *Wales-Strippit Corp*

Observations in short-run jobbing shops and volume production plants produce these conclusions:

1..The shop has no press-brake equipment, although several jobs are in process that could be produced at lower cost in this type of machine.

2..The press-brake equipment is used part time, while highly suitable work is being done in individual small presses at operating and handling costs that are obviously higher.

3..The shop management is not aware of accessory equipment that would convert its machines into more serviceable producers, and mistakenly believes that press brakes are restricted to elementary forming work.



ROUND TABLE

Decimal Dither

"Hey, Ed; have you seen any of these new prints with decimal dimensions on them? They look good!"

"Oh, nuts, Al. Did Engineering accept another of those jobs with metric markings again? I thought the last one taught them a lesson."

"Not metric, Ed—decimal. Look here—the dimensions are all in whole numbers and decimals; no fractions at all."

"Yeah.. It looks confusing to me, Al. I'd as soon stick to the old system where you can use fractions for all dimensions that don't have special tolerances."

"That's the whole point, Ed. This system is simpler and less confusing. What's the sense of being inconsistent and mixing fractions and decimals? You always read a mike to a decimal dimension."

"But you read a scale or caliper to a fraction, Al. Besides, what's the use of having decimal-equivalent charts all around the shop if you don't use them? And why waste all the memorizing everyone's done on these charts?"

"I think you're putting up your own objections to fractions, Ed. Why bother with all that conversion; why not have it done for you by the engineering department? It should be a lot easier after you get used to it—and faster, too."

"You won't sell the boys on it, Al. If a man's worked with one kind of number system all his life, he resists a change."

"I suppose the old duffers will, Ed; but they'll come around after a week or two. Even an old goat like you can see the advantage of simpler numbers. Another thing; you mentioned tolerances. Well, they're easier to show with decimals. When you have a general tolerance on a print, you can show plus-or-minus five thousandths by simply dropping the last digit on the number; like 0.250 with nothing after it. When you have a special tolerance, you use the nominal dimension, like 0.2500, and just add the tolerance on the end. Then you can add and subtract the tolerance directly and get your limits without converting a fraction."

"I suppose it works, Al, but I don't think you'll get much of a response in the shop. Fractions have been with us too long to be dropped now."

IS ED TOO PESSIMISTIC about shop acceptance of decimals? Are decimals really easier and quicker to use, or are fractions best because they've been with us so long? Your opinions may guide others in decisions on the subject. Discussions of earlier topics appear on later pages.

American Machinist
SPECIAL REPORT
NUMBER 353

HOW TO MACHINE
acrylic plastics

By Dr ORVILLE L PIERSON, Head, Design & Fabrication Laboratory, ROHM & HASS CO

Most manufacturers who use cast, acrylic plastic parts in their products perform some machining in the processing. Such operations range from trimming with a bandsaw or router to turning and milling high-precision elements

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SAWING TECHNIQUES

Acrylics can be cut with any of the saws used for wood and metal. In many shops the same saws are used as for other materials, but better results are obtained by using blades specially sharpened for plastics. Where a considerable amount of cutting is performed, select and reserve special circular, band, and jig saws chosen for the type of work to be done. Circular saws are preferred for straight cutting; jig saws for cutting curves of small radii in thin sheets; and band saws for curves of larger radii and for straight cuts in thick material. Follow these general rules as to the type of saw to use on different types of jobs:

The thicker the stock, the fewer teeth per inch and the greater clearance will be required. Select larger diameter (15- to 16-in.) circular saws, as the teeth have more chance to cool during each revolution. Larger saws also stay sharp longer and do not gum so quickly. Similarly, band saws are preferable to circular saws for cutting thick material, as the teeth have a chance to cool and there is less risk of binding. Band saws are thinner and remove less material, so less material is lost as sawdust.

CIRCULAR SAWS

Circular saws for cutting acrylics should be hollow ground, or should have set or swaged teeth to prevent binding. Install stiffening collars to support the blade. To have a saw run perfectly true, it is absolutely necessary that the collars and stem of the arbor be well fitted. For thin stock, blades sufficiently hollow ground do not require "set" teeth and, consequently, give a smoother cut and make a narrower kerf. For somewhat thicker materials, use a spring set with alternate teeth bent to right and left. To obtain a smooth edge, side dress the teeth on the machine after setting and sharpening. This is done by rubbing a stone with a circular motion, holding it flat against the plate of the blade. This insures that all teeth are in proper alignment.

For the heaviest cutting, use a swaged-tooth saw. In this blade, the tips of the teeth are widened so the width of the cut is greater than the width of the body of the blade, providing the necessary side clearance. Side dress swaged teeth also, to obtain a good edge cut. File or grind saws after setting or swaging to insure proper sharpness.

In any case, all teeth should be of uniform height. Teeth of uneven length will cause excessive chipping, and possibly cracked blades, because the cutting strain is concentrated on a few teeth, rather than distributed evenly over all teeth. Similarly, all teeth should be of the same shape. The hook or "rake" of the teeth should be uniform and preferably radial. Saws should be machine filed or ground.

Saws are made of special alloy steel, semi-high-speed steel, high-speed steel, or are tungsten-carbide tipped. Blade life between sharpenings increases in the above order—as does the cost. The extra cost of carbide blades can usually be justified by lower resharpening costs.

The blade should be properly tensioned (hammered) for the exact speed at which it will run. Saws are supplied both in filing and grinding temper. HSS saws are furnished hollow-ground only, as they cannot be spring set. Most special alloy and semi-high-speed steel saws are made flat ground with set, but some are also made hollow or concave ground without set. Therefore, at least two types of saw blades should be available: (a) thin (1/16 to 1/32-in.) hollow-ground, fine-tooth (8 to 14-point) blades for sheet ⅛-in. and under, and (b) a thicker (⅛-in.) flat-ground spring-set blade or coarse-tooth (4 to 6-point) for thicker sheets.

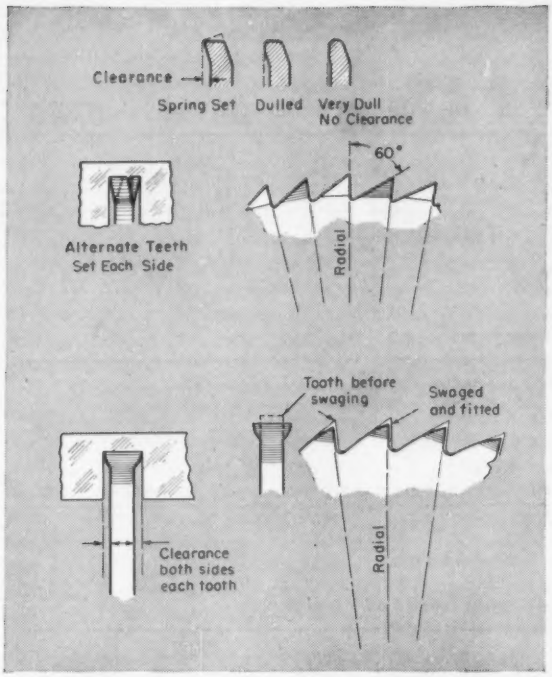
SAWING PRACTICE

To prevent chipping, keep the height of circular saw blades above the table just a little greater than the thickness of the sheet. Hold the work firmly so the saw moves through it in a straight line parallel with the saw blade. Provide a hold-down to prevent chattering which will cause uneven cutting and chipping. In some cases, a slitter directly behind the blade will prevent the kerf from closing. Such closing causes a burn which not only destroys the good surface of the cut, but also tends to heat and dull the saw.

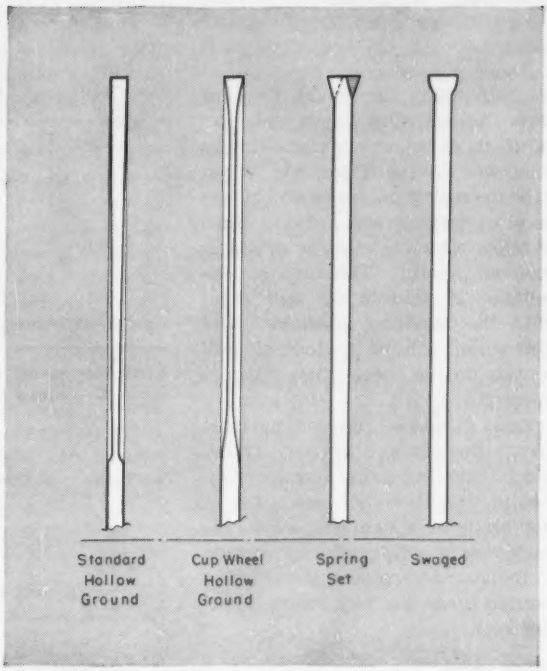
More power is required to cut acrylic plastics as fast as wood. Provide a 2-hp motor for a 10- to 12-in.-dia circular saw. Circular saws should run at 8,000 to 12,000

THICKNESS TO BE CUT, IN.	BLADE THICKNESS, IN.	TEETH PER IN.	TYPE BLADE
0.040–0.080	1/16–3/32	8–14	Hollow ground
0.100–0.150	3/32–1/8	6–8	Hollow ground
0.187–0.375	5/32–1/8	5–6	Spring set
0.438–0.750	1/8	3–4	Spring set or swaged
1.000–4.000	1/8–5/32	3–3½	Spring set, swaged, or cemented carbide

THICKNESS OF MATERIAL controls the preferred blade thickness, no. of teeth per in., and the type of blade for maximum ease in sawing with circular saw.



SAW-TOOTH DESIGN is extremely important when sawing acrylics. Spring set teeth are suitable for moderate thicknesses; swaged teeth for heaviest cutting



STANDARD TYPES of circular saw blades. Hollow-ground blades give smoothest cut but are suitable for thin material only

fpm. Feed the plastic slowly enough to prevent overheating. As with other materials, several sheets of acrylic plastic can be cut at one time by stacking to approximately 1-in. thickness. Multiple sawing, especially with suitably designed jigs, can prove economical and will more than pay for the increased power required.

Acrylic sheets are generally shipped by the manufacturer with protective masking paper on both surfaces. Leave this on when sawing. This means that for every sheet of acrylic, two sheets of masking paper must be cut. As the adhesive tends to stick to the blade, and the paper is somewhat abrasive, trouble can be kept to a minimum by applying a small amount of oil or grease to the blade. You can do this with wick oilers or, more simply, by touching a stick of tallow or white soap against the revolving blade. If a deposit starts to collect on the saw, clean it off before it builds up and fills the clearance space.

The selection of the saw blade is important, as it determines both the efficiency of the cutting operation and the quality of the sawed edge. If the application calls for polished edges, a good smooth saw cut is a great time saver as it minimizes the time required for polishing.

Reduce feed as the blade is leaving the cut to avoid chipping the corners. An even, steady feed will produce a smoother cut and will increase blade life. A masked sheet does not slide evenly on a saw table, so you can usually obtain a better cut by arranging a jig or fixture to slide on the saw table. This fixture can be a piece of plywood or hard compoboard. A little soap or tallow on the bottom will serve to lubricate it.

TRAVELING SAWS

Traveling saws are available. The sheets are held stationary and the saw is moved. Most of these have the saw and motor under the work but several satisfactory saws have been designed with the saw and motor overhead. These saws have a screw feed with a range of 10 to 25 fpm, depending on the speed at which the operator turns the hand crank. Hand crank feed has proved better than motorized feed as the operator can "feel" the best rate of feed. There are hydraulic feed devices available with which, by controlling a valve, the feed can be regulated to the work.

Acrylics such as Plexiglas, which contain no filler, do not dull saws excessively if reasonable care is taken to avoid overheating. Coolants increase life between sharpenings and improve the quality of the cut. A small stream, or even a mist, of coolant directed onto the blade as it enters the cut will prove effective. A 10% solution of soluble oil in water will help prevent rust, and will prevent heating if the other conditions are right. To obtain a smooth edge, even when coolants are used, the saw must run true and have no high teeth. It must be side-dressed smooth so the kerf is even. Hollow-ground saws can be used with a coolant for thicker material because less side clearance will be required.

Recirculation of the coolant is not very practicable as it is thrown around by the saw. Provide a drain

to drain away the liquid. Coolant wets the masking paper and expands it, so remove it immediately after wet sawing if possible. When it is necessary to leave the paper on after wet sawing, provide racks to allow air circulation to dry it as soon as possible. Too high a percentage of soluble oil will react with the masking adhesive, so a film which is hard to clean off will remain on the sheet when it is unmasked.

Saws should be guarded, particularly when coolants are used. Overhead traveling saws require particular attention because most of the blade is above the work. Incorporate a chip collector system in the guard to remove the sawdust carried up as the saw comes out of the kerf.

SAW WIDTH IN.	POINTS PER IN.	THICKNESS IN.	THICKNESS GAGE	MINIMUM RADIUS IN.
3/16	7	.028	22	1/2
1/4	7	.028	22	3/4
3/8	6	.028	22	1 1/2
1/2	5	.032	21	2 1/4
5/8	5	.032	21	3
3/4	4	.032	21	4 1/2
1	4	.035	20	8
1 1/4	3	.035	20	12
1 1/2	3	.035	20	20

Note: Henry Disston & Sons Product Manual

BAND SAW BLADES must be selected on the basis of the minimum radius to be cut in the material. This will affect the width, gage, and no. of teeth per in.

WIDTH, IN.	THICKNESS, IN.	TEETH PER IN. REGULAR SET				EVERY TOOTH SET	
1/4	0.025	...	...	4	6	...	...
1/2	0.025	...	3	4	...	...	...
3/4	0.032	...	3	...	...	...	3
1	0.035	2	3	...	...	2	3

Note: Simonds Saw & Steel Co. booklet "Metal Cutting Band Saws"

The following table compiled from information published by Do-All Co on the use of their metal-cutting bandsaw blades for best results in sawing Plexiglas.

	WORK THICKNESS, IN. 1/16	1/4	1/2	1	2	3	4	6
Saw pitch	24	10	6B	5B	4B	4B	3B	2B
Type tooth	R	R	....	....	....	....	....	....
Temper	A	A	....	....	....	....	....	....
Saw speed (fpm)	4800	4000	3600	3200	2800	2600	2500	2300

SPECIFICATIONS FOR SKIP-TOOTH bandsaws for sawing Plexiglas. These saws will remain sharp for long periods and may be discarded when dull. This may be cheaper than resharpening

BAND SAWS

Where flat sheets are to be cut in curves, or where formed parts are to be rough trimmed, use band saws. Large saws with a 30- to 36-in. throat are best for production work, although the smaller home-workshop saws will do for small work. Some of the newer band saws are arranged so the speed can be changed to suit the work. This is an advantage as, in general, the thicker the material the slower the speed to insure against overheating. Speed, feed, and thickness of stock should be such that each tooth cuts a clean chip. If the speed is too high in proportion to the feed, the teeth will rub and heat up, rather than cut free. Run the blade at speeds of from 2,300 to 5,000 fpm.

Metal-cutting blades are best for acrylics. They stay sharp longer than the softer woodworking blades and, when dull, should be thrown away. This is cheaper and better in the long run than resharpening woodworking blades. They are supplied by several manufacturers in 100-ft coils and can be made up to the proper length by brazing or welding. A small butt welder will soon pay for itself in a production shop, and offers the added advantage of permitting use of the band saw for cutting large holes.

Blade thickness, width, and number and type of teeth will depend on the size of the saw, the thickness of the material to be cut, and the minimum radius. All metal band saws are set to give side clearance. Always use the widest blade allowable for best results.

In ordinary work there are few exterior curves less than 1½-in. radius, and few interior curves less than ¾-in. The average shop requires two ¼-in. or ⅜-in. saws for curved work, and two ½-in. or ¾-in. saws for ripping and cutting work of wider sweep. The maximum thickness of the blade is controlled by the diameter of the wheels. The larger the wheels the thicker the blade can be. For 36-in.-dia. wheels, 20 gage is about the thickest material recommended for hardened metal-cutting blades.

Special band saws, known as skip tooth or buttress saws, have been developed especially for such materials as plastics, wood, aluminum, and magnesium which are soft and require extra gullet capacity for the large chips. Although these teeth are coarse, the shape of the gullet is such that maximum strength is maintained in the body of the blade even in the narrower widths.

These saws have 2, 3, 4, and 6 teeth per in. and are now hardened on the tooth edge in the same manner as regular hard-edge metal-cutting band saws. Cutting soft materials, skip tooth saws will remain sharp for such long periods that they can be thrown away economically when dull, thus eliminating the resharpening operation.

The tension on the saw should be just enough to prevent slipping on the wheels. Too much tension

will stretch the blade and camber it so it will not run true. Not enough tension will allow it to slip on the wheels and tear the tires.

Acrylic sawdust and masking paper dust are carried by the saw onto the tires. Clean this off from time to time because if it is allowed to build up, the blades will run off. Stiff-bristled brushes can be placed so they contact the tires and clean them as they revolve. Hold them with a light spring tension so they will make contact, and yet not wear the tires.

Set the guide rolls or blocks so they just miss the teeth and support the rest of the width of the blade. They should bear on the blade, but only to the point that their rotation can be stopped with the thumb and forefinger when the saw is turned by hand. Adjust the back-up roll so it does not turn when the saw is idling but so it will support the saw when cutting, even with a light feed. Place the upper guide within ½ in. of the work. When cutting formed sections it may be necessary to raise the upper guide. Under these conditions, take extra care to insure proper alignment.

Internal cuts can be made with a band saw if a blade welder is available. Drill hole large enough to allow the blade to pass through, and thread the proper length blade through it. Then weld, anneal, and dress the blade. After the cut is made, cut the blade and remove the part from the saw. Several cuts and welds can be made in a blade, as little material is removed and, when carefully done, the blade is almost as effective at and near the weld as elsewhere. On special jobs this practice may be a great time saver. Do not use it for production where other methods and special machine setups can be employed to better advantage.

JIG SAWS

Jig saws can be used for cutting closed holes in thin sheets. They do not cut well through thick or multiple sheets. The stroke is short and the blade does not have a chance to clear the chips; so the blade gums up. As soon as this happens, the acrylic sheet softens and may actually weld around the blade. If it is necessary to use a jig saw, employ a light feed and clear the teeth often. Do not try to force the work. Let the blade cut, and as soon as it stops cutting clean, back out, clear the chips, and allow the material to cool.

When cutting material more than ¼ in. in thickness it is often desirable to use a band saw with a spiral blade.

VENEER SAWS

Small circular saws, known as veneer saws, should be driven from 10,000 to 15,000 rpm to give a surface speed of from 8000 to 15,000 fpm. Veneer saws in portable tools are used mostly to trim large, formed acrylic parts held in a trim jig or fixture. It is more convenient to take the tool to the work than the work to the tool. Cuts in a plane or developed curves can be made, but compound curves cannot be sawed as the saw would bind.

Smaller saws are available in sets which come with hand-held or flexible-shaft power tools. High speed is required for free cutting.

RULE DIE CUTTING

Sheet acrylic can be cut by rule dies and blanking dies. Material 0.080 in. thick must be heated to the forming temperature before stamping. Information as to time and temperature for various thicknesses is given in an accompanying table. Material thinner than 0.080 in. can be stamped cold to approximately final dimensions but, where a finished edge is required, machining or sanding will be necessary. Small-diameter holes, ⅛-in. and under, can be cold punched in acrylic up to ⅛ in. thick with reasonable accuracy.

MATERIAL IN.	OVEN TEMP. °C	TIME IN OVEN MIN.	LOAD PER LINEAL IN. LB.
	RULE DIES		
0.060	160	4	100
0.080	160	6	100
0.125	160	6	125
0.250	160	8	163
	MODIFIED SHOEMAKER DIES		
0.375	160	10	163
0.500	160	12	234
0.625	160	15	234
0.750	160	20	264

BEST RESULTS IN CUTTING with rule and blanking dies will be obtained by heating to the temperatures shown here. Shearing load should not be less than that specified

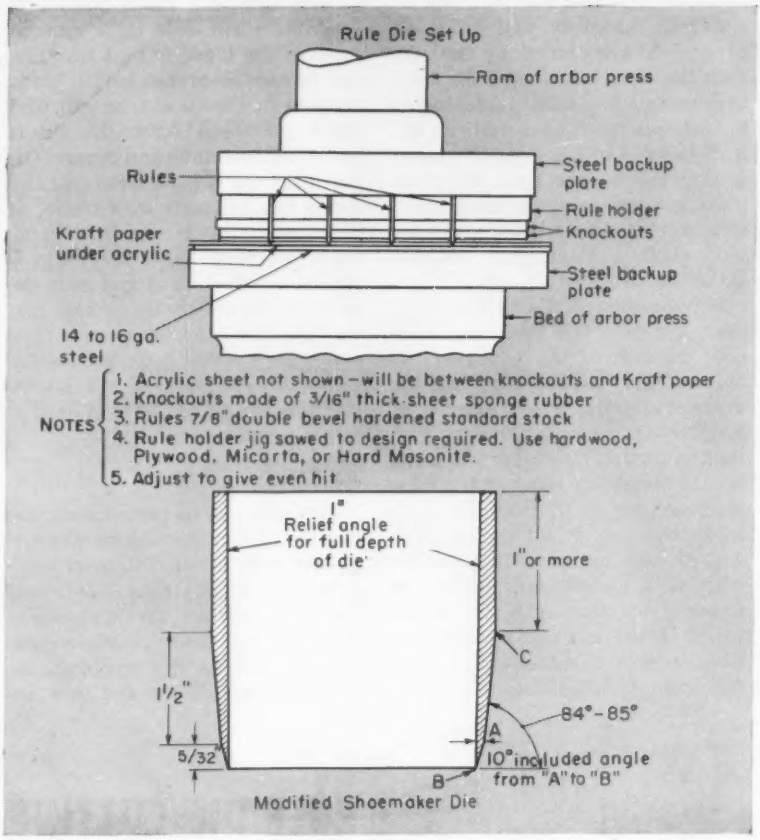
When stamping material thicker than ¼ in. with rule dies, the surfaces of the sheet should be hotter than the core. This allows the cutting edge to enter easily, and prevents dragging. After stamping, reheat to forming temperature so that the edges will be squared. When intricately shaped parts are to be formed, without close dimensional tolerances, they may be rule-die stamped to final shape, reheated, and formed economically. Reheating removes any mark-off caused by the stamping operation, squares up the edges, and makes it possible to form the material all at the same time. Final sanding and polishing of the edges may be required in some cases.

Steel-rule dies, as used in the printing industry, will be found satisfactory for acrylic ¼-in. thick and under. Material thicker than

¼ in. will require special dies, similar to those used in the leather industry for stamping gloves and soles. Stamping acrylic is recommended only where intricate shapes are required, or where the part is to be formed after stamping. The additional operations of heating and reheating will be more expensive than machining operations for parts that are to be used in the flat sheet form.

BLANKING

Blanking dies may be used in place of steel rule dies where the edge conditions are of no importance. Blanking dies tend to drag in material from the top surfaces, producing a tapered hole. They are more expensive than steel rule dies, except for standard sizes and shapes. Circular holes can possibly be drilled or fly cut cheaper than they can be stamped.


Rule Die Set Up
Ram of arbor press
Steel backup plate
Rules
Rule holder
Knockouts
Kraft paper under acrylic
Steel backup plate
Bed of arbor press
14 to 16 ga. steel
NOTES
1. Acrylic sheet not shown – will be between knockouts and Kraft paper
2. Knockouts made of 3/16" thick sheet sponge rubber
3. Rules 7/8" double bevel hardened standard stock
4. Rule holder jig sawed to design required. Use hardwood, Plywood, Micarta, or Hard Masonite.
5. Adjust to give even hit
1"
Relief angle for full depth of die
1" or more
C
1½"
84°-85°
A
5/32
10° included angle from "A" to "B"
B
Modified Shoemaker Die

SETUP FOR PUNCHING with rule dies and modified shoemaker dies in stand

MACHINING ACRYLIC

The usual rules of good machining practice apply to machining acrylic. An experienced machinist will have no difficulty handling the plastic as soon as he gets the "feel" of the material.

In general, cutting edges of tools should have no rake, and should have a scraping rather than a cutting action. Hold tools and work firmly to prevent chattering. Standard metalworking equipment should be used with a light feed to produce a clean continuous chip. Too rapid a feed will chip the work. Tools should be sharp, clean, and free of nicks and burrs.

When proper speed, feed, and cutters are used, machined surfaces will have an even, semi-matte surface which can be brought to a high polish by sanding and buffing. Remember that acrylic, like most plastics, is a poor conductor of heat and, as a thermoplastic, tends to soften if frictional heat is generated during machining operations. Excessive heat usually results in gumming and tearing of the plastic or sticking of the tool.

If the tools are sharp and properly ground, acrylic can be machined at reasonable speed without a coolant. Where excessive heat is encountered, use water or soluble oils. Other coolants may contain chemicals harmful to acrylic or to the masking paper adhesive. When coolants come in contact with the paper they reduce its effectiveness and make its removal difficult.

Acrylic can be machined to ± 0.001-in. tolerance. To maintain close tolerances, anneal the material properly and specify the temperature and humidity conditions at which the parts are to be inpected. To illustrate the importance of this, here is a typical example:

Turn a disk of heat-resistant-grade acrylic to 6.000 in. ± 0.002 in. Coefficient of thermal expansion is 0.000042 in. per in. per degree F. Temperature of disk at time of machining, 92 F (hot summer day). Diameter at time of machining, 6.001 in. (within tolerance). Inspected two months later (cool fall morning) at 60 F, or 32 F cooler than when machined, and found to measure 5.993 in., or .006 in. under minimum tolerance. Cooling 32° contracted the acrylic by 0.000042

x 6 in. x 32° or 0.0081 in. If the disk is warmed up to the temperature at which it was machined, then rechecked, it will be within limits.

Where any appreciable portion of the surface is to be removed by a series of machining operations, or where thick material is to be machined, anneal the plastic at various stages in the process; and again after all operations are complete. For example, rough machine to approximate tolerances, then anneal. After annealing, finish-machine, removing as little material as practicable, following by a second annealing.

ROUTING AND SHAPING

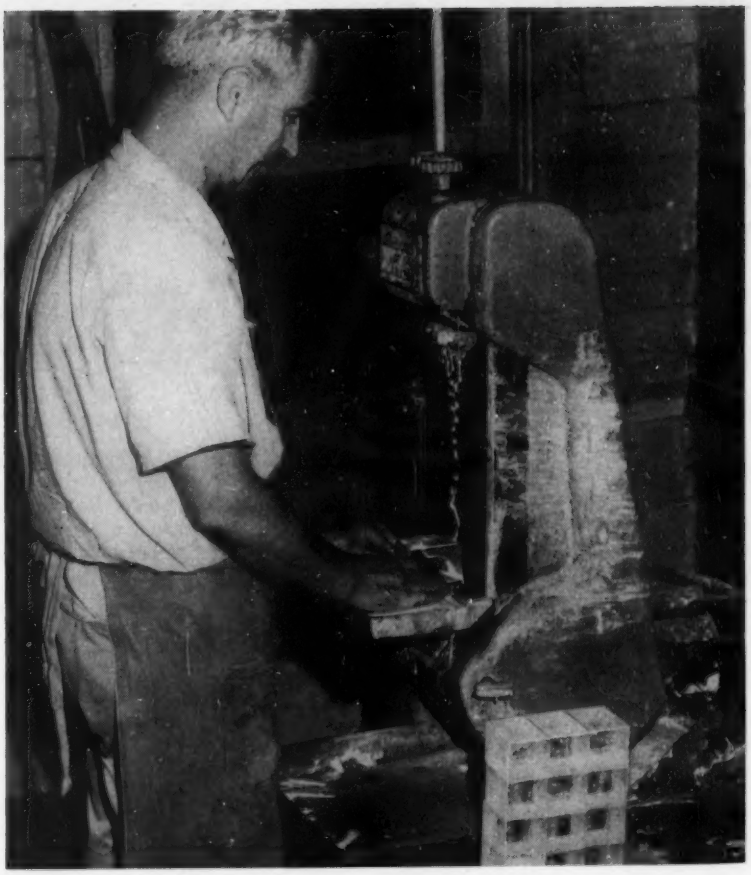
Shapers are used for a variety of operations such as machining of rabbeted edges to permit flush mounting, machining to predetermined cross-sections, and cutting to size both flat and formed parts.

Routers should have a no-load spindle speed of 10,000 to 22,000 rpm. Two- or three-flute cutters under 1½ in. in diameter running at these speeds will produce the smoothest cut. At slower spindle speeds, the cutter should have more flutes or blades and should be larger in diameter to produce the necessary peripheral speed.

Keep cutters sharp, with a back clearance angle of about 10° and no rake. Grind a slight radius on the corner of the cutter so it will produce a fillet in the shoulder of a rabbet. Unless this precaution is taken, the acrylic piece may fail at this sharp corner. Feed slowly and continuously to reduce cracking and avoid overheating. Use an air blast or suction system to remove chips and help cool the cutter.

Because of thickness variations in cast acrylic sheet it is not possible to maintain close tolerances in both toe and depth of rout. Relatively small tolerances can be maintained in either the toe or the depth; but when the tolerances of both are critical, a second routing operation is required—with a corresponding increase in costs.

Tolerances of ±0.015 in. can be maintained in depth or toe of rout in a single operation. Tolerances of ±0.030 in. or better can be held in the length of shoulder of the rout. Standard HSS end mills may be used for rabbetting.



ABRASIVE BELT machines provide a rapid means of polishing acrylic plasters

ROUTING CUTTERS are convenient for contour shaping. Sheets may be stacked

Portable routers can be used when the part is too large or cumbersome to bring to the machine. They are useful for obtaining a right-angle cut when trimming the edge of a formed piece. Where a number of flat panels are to be trimmed, with other than straight edges, it is sometimes advisable to

use routers or shapers, such as are used in woodworking, to produce decorative molding or profiles on edges.

TURNING

Acrylic can be turned on an engine lathe to produce an excellent semi-matte surface. Cutting tools should have a zero or slight negative rake and be held at or below the center line.

Work 2½ in. in diameter should turn 700 to 800 rpm. On larger diameters, surface speeds of 500 fpm with feeds of 0.004 to 0.005 ipr will cut a clean, continuous chip. Do not employ heavy feeds. Keep feed constant throughout the cut; if it stops, the acrylic may be marked. Attempts to remove too much material at one cut will result in chipping, chattering, or other damage to the piece.

DRILLING

Twist drills commonly used for soft metals can be used for acrylic, but better surface finish and higher production rates can be obtained if special drills and techniques, which will efficiently clear the hole of chips are used.

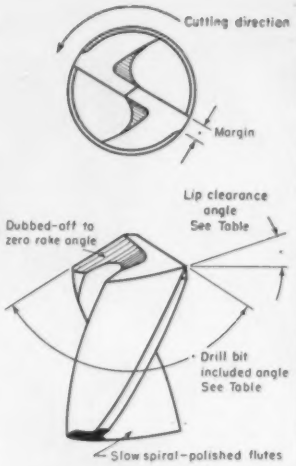
Chip removal is no problem in drilling shallow holes but, in deep holes, clogged chips can rub against the walls of the hole, scoring, burning, or tearing the surface. Therefore, different bits, feeds, and speeds are recommended for different hole depths.

Grind the bit carefully, free of nicks and burrs which would affect surface finish. It is particularly important to dubb-off the cutting edge to zero rake angle, making the web as thin as possible at the top. Drills with slow spiral, polished flutes are recommended. Flutes should be as wide as possible, especially for removing a continuous ribbon of material in drilling medium deep holes. A special drill with extra wide spirals will clear a continuous chip from a hole five times as deep as its diameter.

For drilling holes of shallow and medium depth, no coolant is needed. However, a jet of compressed air directed into the hole is helpful. For "powder drilling" deep holes, a coolant is necessary. Compressed air can be used for hole depths of approximately five times the diameter of the hole. A water or soluble oil-water coolant can also be used. When applied at the entry hole, however, a liquid coolant is actually pumped out of the hole by a drill and seldom reaches the drill point. Application through a standard oil-hole drill insures delivery of the coolant to the drill point. It is also possible to apply coolant by filling a pilot hole drilled 95% of the way through the material, or through a pilot hole drilled through from the opposite surface.

Large-diameter holes can be cut with hollow end mills or fly cutters (or trepanning tools). Grind the cutters of the latter with zero rake and adequate back clearance, just as lathe tools are ground.

All these tools can be used in the standard vertical-spindle drillpress or, where indicated, in flexible-shaft or portable hand drills. The speed at which acrylic can be drilled successfully is limited, in most cases, by the quality of this equipment. In other words, the material can be drilled at the highest speed at which the drill will not wobble enough to affect the finish of the hole.



	Shallow	Medium	Deep
Ratio of Hole Depth to Diam.	Less than 1½ : 1	1½ : 1 up to 3 : 1	Greater than 3 : 1
Chip removal	No problem	Continuous ribbon cleared by flutes without clogging	Material removed in form of powder or minute chips
Drill Bit—Included Angle	55-60°	Depends on size of flute	140°
Drill Bit—Flutes	Wide, polished, slow spiral	Wide, polished, slow spiral	Wide, polished, slow spiral
Drill Bit—Rake Angle	0°	0°	0°
Drill Bit—Lip Clearance Angle	15-20°	12-15°	12-15°
Coolant	None	None	(See text)
Rate of Feed	—	As necessary, to cut continuous chip	Slow—approx. 2½"/minute so that powders, not shavings are formed

TWIST DRILLS FOR ACRYLICS will give a better finish and higher production rates if modified as shown here

For the sake of both accuracy and safety, hold work in suitably designed clamps or fixtures. Fixtures with suitable guide bushings will permit tolerances of ± 0.030 in. in location of the hole and ± 0.010 in. or better in the diameter, bearing in mind the need for maintaining constant temperature of the acrylic to achieve good accuracy.

TAPPING AND THREADING

Acrylic can be tapped and threaded with the tools used for copper and brass. It is preferable, however, to modify standard taps and dies to produce threads with rounded grooves to reduce the danger of cracking at the apex. Use heavy coarse threads.

Threading and tapping are not recommended for assembling acrylic parts where the assembly is to carry an appreciable load or is to be subjected to high or sudden stress. If the parts are to be frequently assembled and dismantled, reinforce the tapped hole with a metal insert or bushing.

During tapping and threading, keep the material cool. In manual operations, back out the taps periodically to clear the chips. A lubricant is recommended for power operations. Machine speed should be at least as slow as that used for copper or brass.

small plants get together...

MUTUAL HIRING SAVES HEADACHES

A non-profit employer co-op with 150 company members (none of whom hire more than 350 workers) has been formed in Los Angeles to give the advantages of big-company employment methods at small-company cost

Some 30 small metalworking companies in Los Angeles are getting "big company" personnel services without a single full-time personnel man on their payrolls.

They have joined a cooperative group known as Mutual Employers Association. Founded in 1949 by seven firms harrassed by personnel problems in a highly competitive labor market, the co-op has grown to 150 members, whose work forces range from 6 to 320 employees.

MEA's central personnel office offers these advantages to member companies:

• **Locating employees.** Through newspaper ads, job bulletins sent weekly to about 250 sources of labor supply, and referrals by people who have been placed, MEA draws about 2000 to 2500 job applicants a month—a wider selection in any given field than a single company could hope to have.

• **Screening.** By interviews, extensive testing by trained people, thorough checking of references, it greatly reduces hiring of misfits—with a consequent reduction in turnover for member firms.

• **Moneysaving.** According to a recent survey, the average cost of hiring in the Los Angeles area is $300. For MEA members it's $60.

MEA is not just another employment agency, with the employer, rather than the employee, footing the bill. While it doesn't do the actual hiring, neither does it send out a broadside of applicants, leaving the employer the real job of selecting. It sends either a few carefully rated people for a job opening, or, if requested, MEA will make the final selection.

MEA's board of directors is made up of management personnel from member firms, but the actual work is done by a fulltime staff of specialists. Heading the 16-member staff is R E Callaway, industrial consultant, who founded, and is president of, the association. Director of Employment is Dr Ward J Jenssen, who holds a Ph D in industrial psychology, and is a member of the NAM industrial relations advisory committee.

When a firm joins MEA, it provides the MEA office with 8-page job descriptions of every job classification. These descriptions are as thorough as they can be made, showing not only the duties of the job, but also rates of pay, physical effort required, hazards, amount of skill and judgment required, and other facts necessary to pinpoint the right man for the job. Descriptions are supplemented by interviews between MEA experts and company management, and, where necessary, on-the-scene inspection by MEA.

When an order is placed with MEA, applicants are screened in several ways. Four "pretest" interviewers give preliminary screening. If the applicant is determined in the interview to be without promise for the job, he goes no further. If the pretest interviewer believes there's a potential, the applicant goes to the testing department.

In this department, there are more than 200 different types of tests available. Number and kind of tests used in each case depend on the job to be filled. A tool and die maker, for instance, gets seven: 1. Mental capacity; 2. Manual and finger dexterity (rated by time-performance tests on movements of blocks, pegs, and the like); 3. Tool comprehension; 4. Quantitative space relations, such as dimensions and proportions; 5. Language comprehension, with particular reference to shop terminology; 6. System manipulation and basic math; and 7. Vision (standard medical test of visual efficiency).

A prospect for factory superintendent would take not only these tests, but also tests covering sense of organization, judgment, memory, perception, and psychological temperament analysis to determine such personality traits as his ability to handle men, maintain discipline, assume responsibility, and accept criticism. The testing process takes

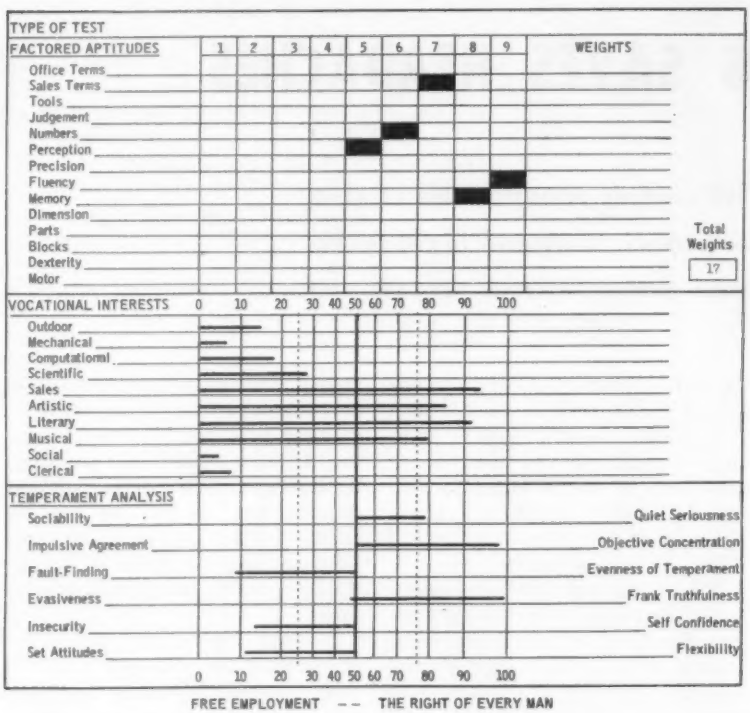
MUTUAL EMPLOYERS ASSOCIATION INC.
307 West Eighth Street, Los Angeles 14, California

Date _____

PROFILE REPORT ON John Doe Position Salesman

Applicant is considered a Q-3 * risk for this type of work. This report should be evaluated with job experience. * (See reverse side.)

Mental Capacity: Wonderlic 34 (Criterion 27 to 50)
Typing (wpm) _____ Shorthand (wpm) _____



FREE EMPLOYMENT -- THE RIGHT OF EVERY MAN

*The applicant's qualification is expressed at one of five "risk" levels, as follows:

UQ – UNDERQUALIFIED, and not recommended for hiring, except in very exceptional circumstances.

Q1 – MINIMUM QUALIFIED, and could do the job satisfactorily; recommended for hiring if other factors appear to be favorable.

Q2 – WELL QUALIFIED, a better than average risk.

Q3 – EXCEPTIONALLY QUALIFIED, an excellent risk.

Q4 – OVERQUALIFIED, but a good risk if promotion lines are open.

The relation of aptitudes to job skill for the various job areas is summarized below: (It is recognized that in all these areas there are gradations of jobs and specialized jobs that require extra skill; the listing below is of the entry job in that area):

Very little job skill involved; aptitudes play predominant role.	Junior Clerk, Numbers Clerk, Contact Clerk, Unskilled Worker, Semi-Skilled Worker, Inspector, Sales Clerk.
Some job skill involved; but aptitudes play a major role.	Senior Clerk, Factory Machine Operator, Vehicle Operator, Salesman.
Job skill or knowledge most important; but aptitudes also important.	Office Machine Operator, Secretary Skilled Worker, Sales Engineer, Scientist, Engineer, Office Technical, Writer, Designer, Instructor, Supervisors.

****

REMARKS:

about two hours for the skilled worker, four or five hours for the factory superintendent.

While the applicant is being tested, a special department is checking references. In the case of key personnel, all possible information is obtained from every available source. For general workers, references are obtained from their two most recent employers.

On the basis of these interviews and tests (plus further interviewing by Dr Jenssen in the case of key personnel), a profile report is prepared. If the applicant is felt to be a good bet for the job, he is sent to the prospective employer. With him the applicant carries, in a sealed envelope, the profile, which bears the rating determined from the tests and interviews. (See illustration.)

This screening process pays off. Of the 2000 to 2500 job applicants interviewed each month, about 450 to 500 are determined, through preliminary interviews, to be worth further study. Of those so tested, about 60% are found to be qualified and are referred to member firms for employment. Of these, about 82% are hired.

Sample reactions from member firms are enthusiastic. Considerable company time is saved, much of it time of highly paid personnel, and only select applicants show up for work—so select that some men are hired sight unseen. Turnover is greatly reduced, because incompetents and chronic job-jumpers are screened out. One member firm said it had hired applicants in spite of undesirable test results—and in each such case regretted the action.

MEA does other valuable work for members besides screening prospective employees. When a company first applies to the association for membership, it submits information on its rate structure and general personnel

◀

TYPICAL PROFILE REPORT, showing various standards tested. Note that applicants are placed in one of five categories—from underqualified to *too well qualified*, to be accepted only if opportunities exist for prompt promotion

policy. If the MEA staff believes these things can be improved, it makes suggestions for changes to the prospective member. If a rate structure appears too far out of line to attract good employees, and the company will not change it, the company's membership application is turned down. MEA doesn't want to drive costs up with impossible recruiting tasks.

When a company is having turnover problems, MEA will try to find out why. It interviews all workers who leave member companies—voluntarily or involuntarily—and tries to get their views (and sometimes places them with other members). This often turns up a problem in pay, working conditions, or supervision that can be remedied.

For locating one company's trouble spot (it turned out to be confused orders on the part of the plant manager), MEA has been given credit by the company for a 27% production increase with no increase in work force.

AID IN PROMOTIONS

MEA also helps in key promotions. Companies seeking to choose one of several employees for a top post can send the prospects to MEA where interviews and tests will provide a scientific basis for choosing the man most qualified in skills and temperament.

Because of the large number of persons applying for jobs, MEA is able to maintain a temporary labor pool for meeting peak work loads and accelerated production schedules. These workers remain on the MEA payroll, so the employer is relieved of tax deductions and other bookkeeping, and doesn't have his employment insurance rate disturbed by a record of hires and terminations.

MEA also conducts surveys to determine employee morale and acceptance of company policies, helps members in preparation of brochures and employee publications, and performs other related personnel functions.

To finance MEA's activities, member firms are assessed amounts varying with their size and the amount of work done for them. Each firm pays about 80¢ per month for each regular employee. Also, they pay fixed rates for testing, reference reports, and other screening processes which vary from $5 for lower job classifications, to $35 for supervisory jobs.

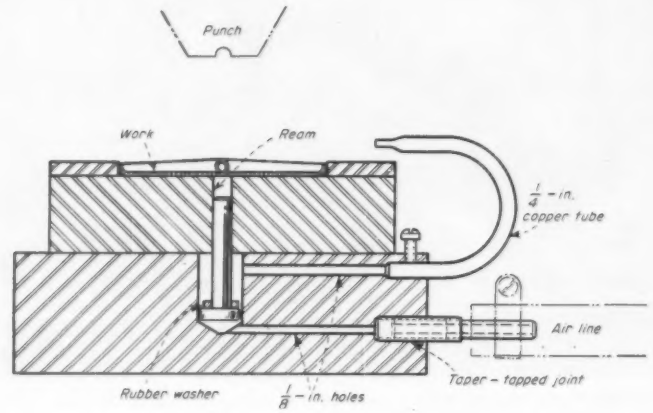
SHOP FOREMAN of a member company instructs MEA applicant, referred as press operator, on special kick presses for modification of deep-drawn metal bases

MEA isn't perfection. Among drawbacks cited by members are: in spite of the thoroughness of job descriptions obtained by MEA, its staff can't be as familiar with job conditions as a personnel office devoted to one company. MEA's downtown Los Angeles location is sometimes inconvenient for prospective employees living near an outlying plant (though in special cases MEA will send an interviewer to the applicant). Finally, though sizable the MEA labor pool isn't always adequate in all categories.

On the whole, though, member firms feel they're getting results they couldn't get any other way. In some respects, MEA's services are better than even most big companies can afford.

"ah . . . now down . . . there no . . . ahm, there . . . harder . . . ahaa . . . umm ! !"

Practical Ideas



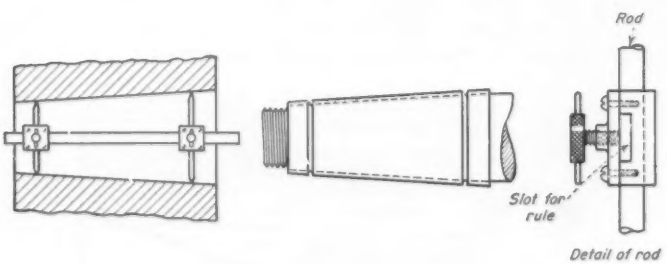
Cam-Operated Air Cylinder For Rapid Part Ejection

Deep-nested or tight parts are quickly and easily ejected from dies with this inexpensive arrangement. It consists of a polished piston which rides up and down in a reamed cylinder in the base of the die; and a copper tube bent so that an air stream from the tube will blow out the ejected workpiece.

The air intake is cam-operated from the press countershaft, and, as air is admitted, the piston rises and knocks the part free of the die. As the piston clears a port in the side of the die-shoe, the compressed air travels through the copper tube bent to blow the part out of the die. The piston head is made slightly spherical, so the piston will fall freely in the cylinder when air pressure is removed. A rubber washer serves as a shock absorber on the top of the piston-head. The air inlet is taper-tapped and sealed with white lead.

Production rate with this ejector is about 1200-1400 pieces per hour.

I prefer this design to "flipper" ejectors, because it permits fixed die position, and is quite inexpensive and quick-acting. Typical construction time is 2 to 4 man-hours. *G J Bowman, Cleveland, Ohio*



Inexpensive Gage Helps Match Tapers

For measuring and matching large tapered holes and shanks, it is often too expensive to make a sheet gage or tapered hole gage. The measuring tool shown is practical, cheap, and accurate. It consists of a steel rule and two end-measuring rods, each having its own holder.

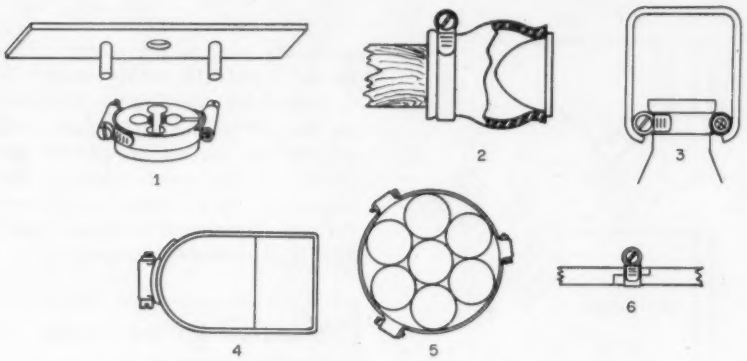
To measure a tapered bore, the end-measuring rods, with rule and holders, should be placed so they touch the taper bore. Dimensions then taken are transferred to the shaft which is to match the bore. Diameters corresponding to these dimensions should be marked off by two cuts. Between the two dimensions so marked, the taper should be turned.

The ends of the two measuring rods should project exactly equally from the center of the rule, and should be exactly at right angles to the rule. A groove having exactly the same width as the rule is milled into the middle of the end-measuring rods, so these rods with their holders may be slid forward and backward on the rule.

This tool has been successfully used to measure tapers to 20 in. diameter. *Carl Jensen, Copenhagen, Denmark*

Bicycle Grip Improves Hammer

A handle-bar grip properly fastened to the handle of a ball-peen or mechanic's hammer will add safety and comfort to use of the hammer. The plastic or rubber grips will fit a 7/8 to 15/16-in. hammer handle. *Fred Lettino, Astoria, LI, NY*



Hose Clips Do Variety Of Emergency Jobs

When a grip or clamp is needed that must not get in the way of the work, the hose clip becomes a good assistant with good holding power. Here are six applications which may prove handy:

1. If the correct size diestock to fit a selected circular die is not available, the problem can be solved by holding the die in two hose clips linked head to tail. When these are drawn tight, the grip is secure. The drive can be applied to the die through a plain bar drilled centrally to pass the screw and provided with two studs spaced the diameter of the clip band, so as to engage the worm heads of the clips.

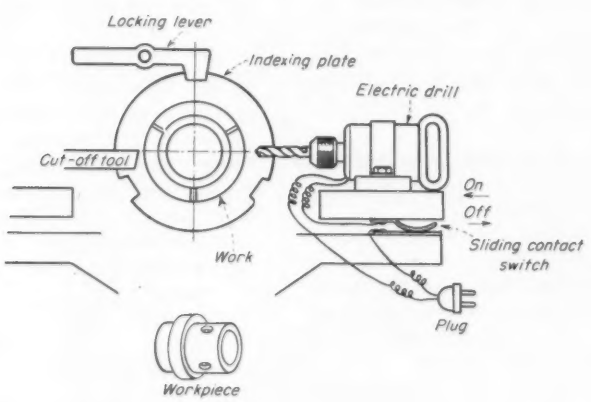
2. Internal polishing of a parabolic mold poses a problem in quick release holding. Use a rubber junction collar which fits the mold snugly. Turn a wooden pin to enter the other end of the rubber collar. Secure the collar to the wooden rod with a hose clip and the problem is solved.

3. Hot moulds with shouldered neck can be handled quickly by securing ganged hose clips beneath the shoulder to bring two worm heads at opposite points of balance. A bent stirrup can then be slipped beneath the worm heads and the mould lifted in one movement.

4. Square sections and semicircular or irregular forms can be secured together for welding or brazing or may be held to transfer drillings by banding them together with hose clips.

5. Worn machine saw vise jaws often won't hold more than a single layer of bars at once, because of jaw tilt. Bundle the bars together with hose clips and any vise will hold the whole lot.

6. To hold two bars together cut each of them to a half-round section (if enough strength is left) and hold them with hose clips. *W D Arnot, Bristol, England*



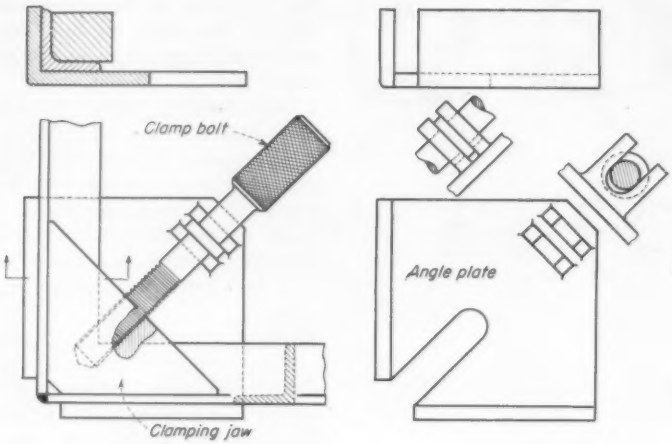
Side-Drilling in Turret Lathe Drills Work in Place

This arrangement permits drilling small holes in place in the turret lathe. An index plate fastened to the chuck locates the parts for drilling. The drill is simply an electric hand drill fastened to the back toolpost, sliding at right angles to the axis of the work. A sliding contact switch turns the drill on when it is moved forward for drilling, and turns the drill off when it is moved out of the way. *M Yamaguchi, Kawasaki, Japan*

Etching Weakens Springs To Specification

Often, especially in model shop work, a spring turns out to be too strong or tough for its function. Instead of going to the trouble of making a new spring, the original spring can be dipped into an acid solution, which will etch the spring and make it softer in function. Either a 50% nitric—50% hydrochloric solution or a mixture of 3 parts nitric, 1 part hydrochloric, and 4 parts water may be used.

To assure uniform etching, the spring should be thoroughly degreased before dipping in the acid. *Haim Murro, Bayonne, NJ*

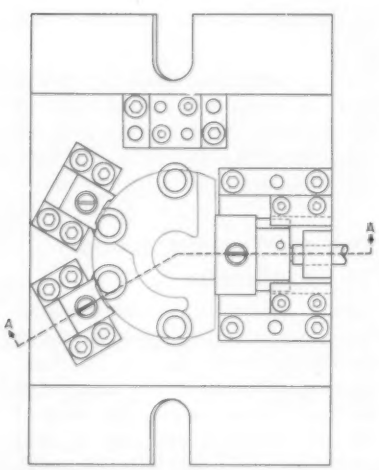


Simple Clamping Device Holds Channels for Welding

A simple clamping mechanism holds steel channels and angle irons (and any other structural shapes, with proper modification of the holding surfaces) in easy position to weld such parts efficiently.

The clamp is made in three parts, an angle plate, a clamping jaw, and a clamp bolt, threaded to fit the clamping jaw with a flange to fit the slot in the plate. (The thread should be rather loose.)

Access for welding is provided by the slot in the angle plate, and a good flat surface results on the inside of the weld, because the clamping jaw prevents flow-through of the weld material. *Franz Eheim, Augsbourg, Germany*

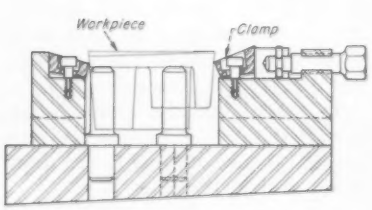


Fixture For Castings With Wrong Draft Angle

Occasionally it is necessary to design a fixture for a base-milling operation on a casting which has the draft angle in the wrong direction.

There have been solutions for such a problem, but few I have seen are very satisfactory.

The fixture shown here solves the problem. The part shown was an aluminum casting and the clamp marks on the work were not deep enough to be objectionable. *Fred Dewick, Verdun, Quebec*



Disconnected Worm Speeds Alignment

When aligning a workpiece on a rotary table, to a spindle, using a dial indicator and a "wiggler," disconnect the table worm and turn the table by hand, instead of turning with the table crank. *Gustav Wernberg, Geneva, NY*

Standard Milling Cutter Forms Large Radius

A recent Practical Idea discussed how to cut a large radius with a standard milling cutter, as long as the error introduced was not too large to be acceptable.

Therefore it is important to know what error to expect. The following information should help.

Whenever possible, the cutter diameter should be greater than three times the width of the work, and never less than one and one-half times the width of the work.

The radius produced, and the proper angle to set the head of the milling machine are given by the formula:

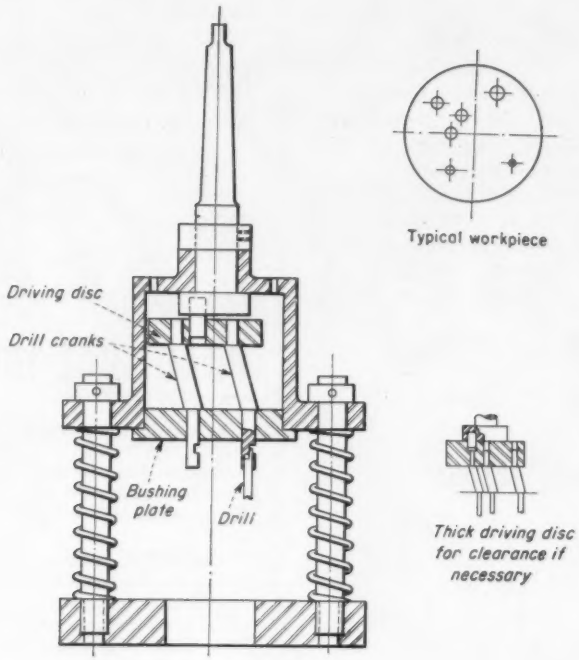
$$\sin A = \frac{r}{R}$$

In this formula, A = the angle between the cutter and the work, r = the radius of the milling cutter, and R = the desired radius on the workpiece.

The error produced can be found from this table:

Cutter Diameter Work Width	E_1 (A = 14½°)	E_2 (A = 30°)
3	0.0011	0.0019
2½	0.0024	0.0040
2	0.0064	0.0105
1½	0.0231	0.0387

This table is based on a 6-in. diameter cutter. When setting machine head, observe limits of + 0° − 0° 15′. *Henry George, Kettering, Ohio*



Eccentric-Driven, Gearless Multiple-Drill Head

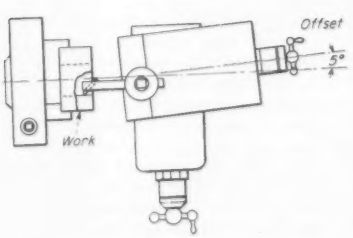
With this relatively inexpensive multiple-drill head several holes can be drilled at one time, however unevenly pitched the holes may be. The only requirement for hole location is that the cranks clear each other if two holes happen to be very close together.

The device is made to attach to a single driving spindle, such as that of a simple drillpress. The driveshaft has a pin fitted to act as an eccentric crank, which transcribes the same pitch circle as the drill crank. The driveshaft is held in place by a collar.

The driveshaft drives the floating disk, which, in turn, rotates all the drill cranks.

A base plate, which holds the guide pins, is suitably fixed to the machine table, and is bored to locate the work or to hold a locating dowel or fixture.

If any hole is too close to the driving pin, the floating plate must be made sufficiently thick (as shown) to clear the moving parts. *Fred Lawrence, Northumberland, England*



Offset Compound Eases Work in Close Tolerances

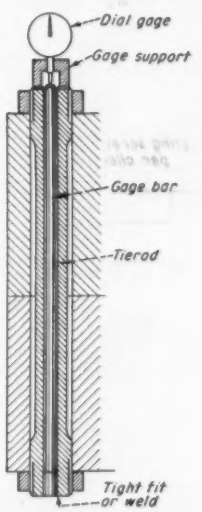
When working to close tolerances, and equipment for measuring is inadequate, offset the compound at 5°. Then the effective feed of each line on the compound dial is approximately 0.0001 in., instead of 0.001 in. *A F Roses, L I C, N Y*

Lightly Cut Screw Thread Simplifies Knurling

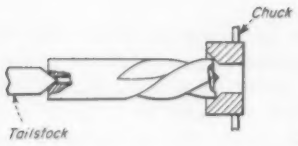
Knurling puts quite a load on a lathe, particularly on spindle bearings and the feed screw. To reduce this stress, particularly on small bench lathes which are not built for heavy stresses, cut a screw thread of pitch approximately that of the knurl, but not to full profile depth. The thread can be cut in one pass, because exact profile and finish are not important. Knurling is then put over this thread; it will be found that the load on the machine is considerably lighter. The lightly cut thread can be made at high speed, accuracy being unimportant. *M Brash, Haifa, Israel*

Gage Bar Checks Tension For Press Setup

A recent Practical Idea, *AM*, Oct 12, '53, in which a gage rod checked the tension on tierods when setting up presses, reminded me of a similar method I have used in the past. In this case the gage



was enclosed in the hollow tierod, and the dial indicator was placed on the end of the tierod. *A Vetsch, Steffisburg-Station, Switzerland*



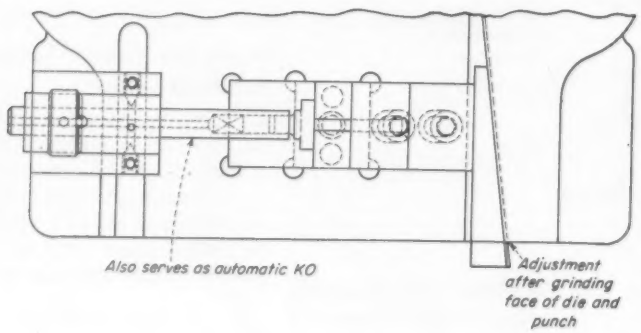
Soft Iron Cylinder Holds End Mill

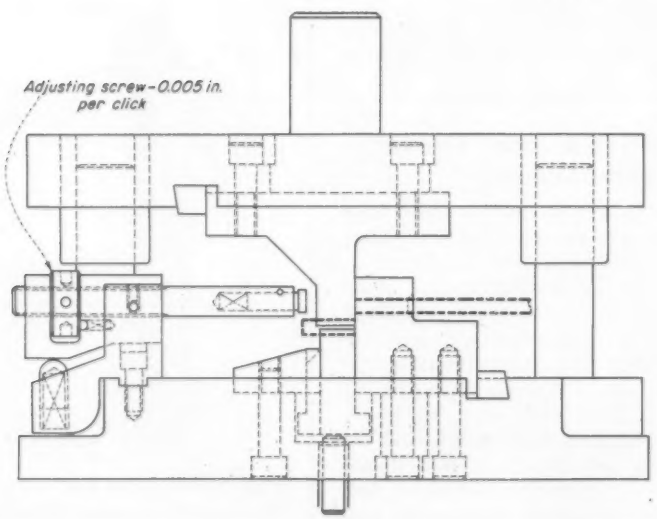
We had to turn the shank of a 1-in. end mill, because no suitable collet or chuck was available. The mill had four flutes, so it could not be held in a three-jaw chuck.

To solve the problem a round piece of soft iron was put into the lathe chuck and drilled with a 13/16-in. drill. Then the hole was countersunk about ½-in. deep. The end mill was then held as shown in the sketch, and the job was completed without trouble.

Light presure from the tailstock imbedded the flutes of the end mill in the soft iron, providing sufficient driving torque to turn the workpiece. *L R Choudhary, Frankfurt, Germany*

Another Square-End Cutoff Die:





SQUARE-END CUTOFF DIE was designed to replace the more expensive method of running the parts on an automatic screw machine. (Our production on several sizes runs into hundreds of thousands per year.) This is an "American version" of the die submitted by Hjalmar Dahl and published in Practical Ideas, and is quite efficient and easy to maintain. *C E Whitcomb, Kenosha, Wis*

WINNER NO. 191
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In Nov 9, 1953 Issue

N PALMER	H DAHL
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PRE-STRESSED BORING BAR	PUNCH AND DIE

for the best PRACTICAL IDEA

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

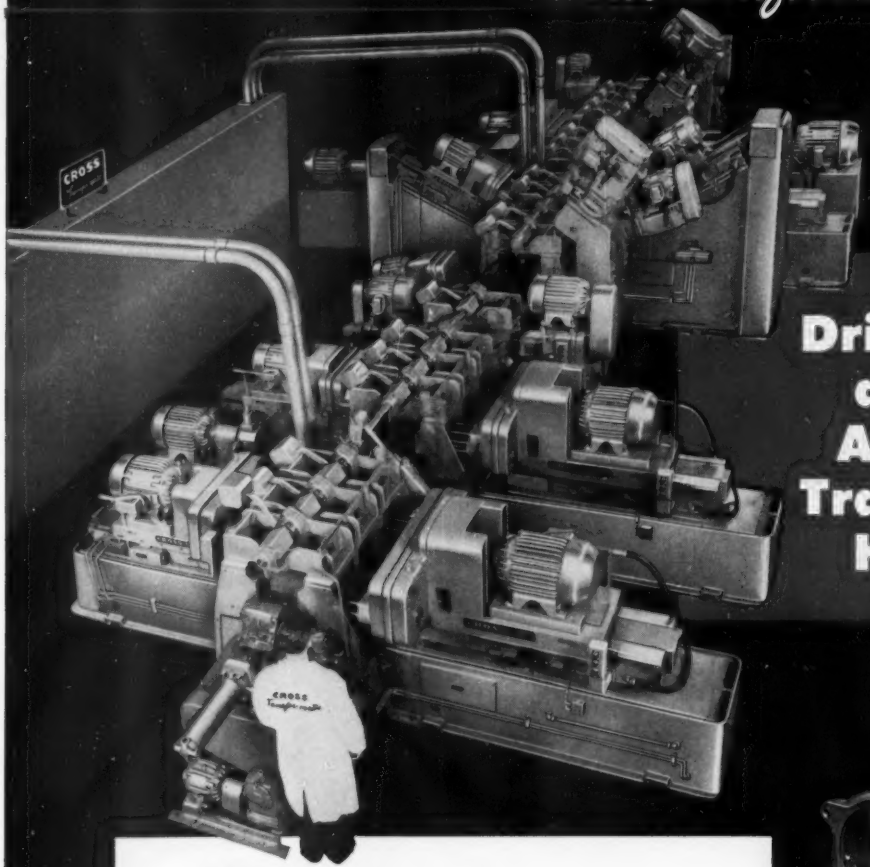
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

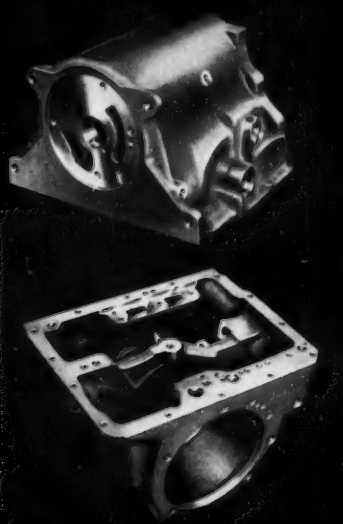
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y.

Another Transfer-matic by Cross



Drills, Reams and Taps Automatic Transmission Housings



- ☆ 29 stations.
- ☆ 78 operations—30 drilling, 12 chamfering, 4 end milling, 3 counterboring, 14 reaming, 15 tapping.
- ★ 100 pieces per hour at 100% efficiency.
- ★ Automatic 90° indexing of part in station 14 for drilling sides and top in subsequent stations.
- ★ Pre-set tools and Cross Machine Control Unit with Toolometers for programming tool changes.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ☆ Other features: Automatic transfer from station to station; hydraulic feed and rapid traverse; individual lead screw feed for tapping; hardened and ground ways; gravity operated cam clamping; J.I.C. standard construction; built-in chip conveyor.

Established 1898

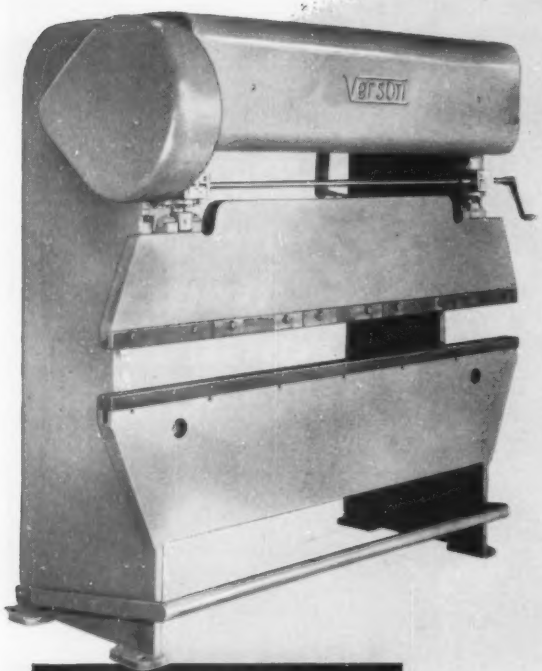
THE CROSS CO.

DETROIT 7, MICHIGAN

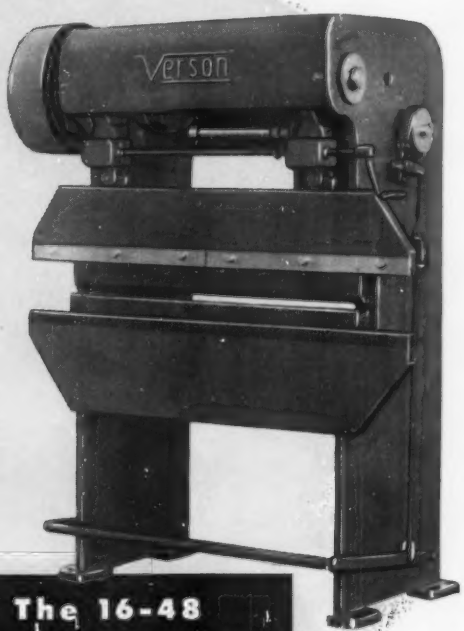
Special MACHINE TOOLS

Now, for the first time...

Standard Verson Press Brakes Available from Stock!



The 1062
25 tons capacity
(16 ga. x 78")
$2,190.00 as shown



The 16-48
15 tons capacity
(16 ga. x 48")
$1,455.00 as shown

Standard Dies Also Available

Standard 90° "V" dies for these press brakes are also available from stock. 78" long set for the 1062 is priced at $124.00. 48" long set for use in the 1062 or 16-48 is priced at $93.00. (Prices are for dies to handle 16 ga.).

To meet the demand for quality press brakes at modest cost and available for prompt delivery, Verson now offers two standard models *from stock*. For the small shop, it means big press standards of design and construction at prices that will fit almost any budget. For the larger shop, it means an economical answer to handling the smaller jobs without tying up big expensive machines.

Important, too, is the fact that you can order these machines as easily as buying an automobile. There is no involved proposal . . . no long delay awaiting delivery. These standard machines are offered at a standard price and shipped from stock.

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American Machinist REFERENCE BOOK SHEET

Form Cutters for Helical Gears...I

By OLIVER SAARI, Development Engineer, ILLINOIS TOOL WORKS

Most handbooks and other sources still give the formula for the selection of the proper spur tooth cutter for milling involute helical gear teeth as being

$$N_e = \frac{N}{\cos^3 \psi} \qquad (1)$$

where

N = actual number of teeth in gear to be cut
ψ = helix angle of gear to be cut
N_e = number of spur gear teeth for which cutter has been made.

No spur-tooth form cutter can give an exact involute shape when used to mill helical teeth—in fact, even for spur gears the form is correct for only one number of teeth in the range specified for a given cutter. But Formula (1) gives a needlessly poor approximation, particularly with small numbers of teeth and helix angles above 20°. Its continued presentation to the gear-cutting public is strange in view of the fact that thirty years ago Ernest Wildhaber published a much more exact and almost as simple formula for finding the cutter number (*AM*—Dec. 20, 1923). This formula is

$$N_e = \frac{N}{\cos^3 \psi} + (P_n D_c) \tan^2 \psi \qquad (2)$$

where the symbols are the same as before, and in addition

P_n = normal diametral pitch of gear and cutter
D_c = pitch diameter of cutter = OD of cutter − 2 × dedendum of gear

This formula gives values which are theoretically exact in both tooth-thickness and pressure angle at one point of the tooth profile, and the spur cutter itself provides a crowning or relieving effect above and below this point.

Possibly one reason that this simple formula has not been included in the readily available

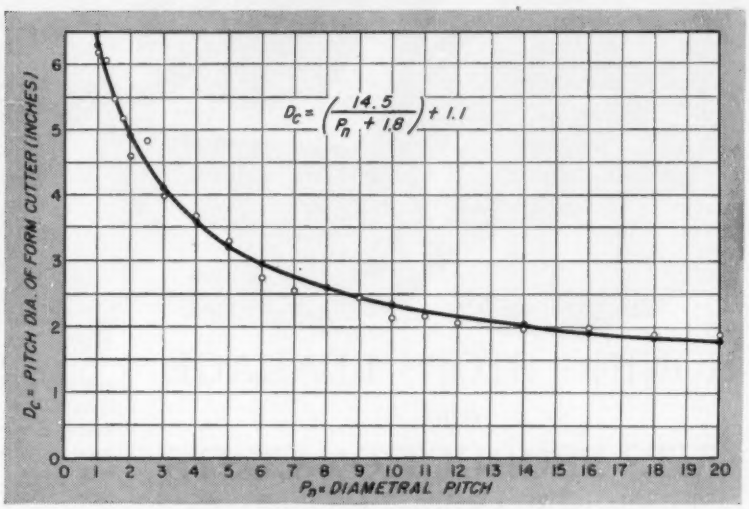

$D_c = \left(\frac{14.5}{P_n + 1.8}\right) + 1.1$
D_c = PITCH DIA. OF FORM CUTTER (INCHES)
P_n = DIAMETRAL PITCH
0 1 2 3 4 5 6
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

FIG. 1 . . . Empirical relationship of gear-cutter pitch diameter to diametral pitch (Standard ITW cutters)

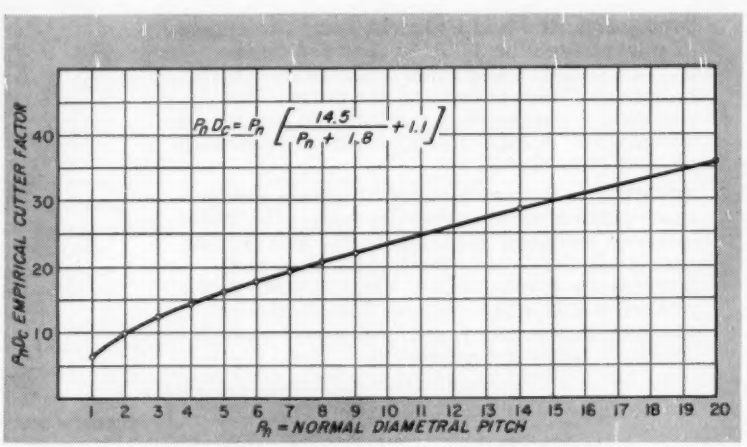

$P_n D_c = P_n \left[\frac{14.5}{P_n + 1.8} + 1.1\right]$
$P_n D_c$ EMPIRICAL CUTTER FACTOR
P_n = NORMAL DIAMETRAL PITCH
10 20 30 40
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Fig. 2 . . . Empirical relationship of $P_n D_c$ to diametral pitch for standard ITW cutters

Today's Tolerances and Finishes Call for HONING

HONING STOPS LEAKAGE *and* CUTS PRODUCTION COSTS

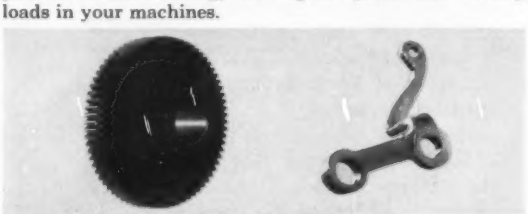
Makes High Quality, Low Cost Hydraulic Controls Possible

PROBLEM: At Fluid Controls, Inc , a tolerance of plus zero minus .0001" is specified on the 2½" I.D. of this aluminum valve body—with no washout allowed around the ports. This precision is necessary to reduce fluid leakage to a minimum. A high production rate is necessary to keep costs down.

SOLUTION: Sunnen Honing Machines produce these parts at a rate of 40 per hour, after other methods including diamond boring and lapping had failed. Savings in production time and elimination of rejects have brought costs down to a very competitive figure. The precision obtained guarantees proper valve performance under all operating conditions.

HONING MAY BE YOUR ANSWER, TOO ...

Just as Sunnen Honing was the solution to this valve problem, it might also help you improve *your* competitive position—could make your products operate smoother, last longer, with increased reliability. Or it could make possible cooler running, and higher speeds and bearing loads in your machines.



From exact sizing of precision parts in soft or hard materials, to de-burring in sheet metal stampings and forgings, Sunnen Honing Machines have proved the answer to many production problems. Surface finish can be held as low as 2 micro-inches RMS in hardened steel. Diameter range is ⅛" to 2⅝". Average installation is under $1,000—delivered and in operation within three weeks.

If you have any problem with inside diameters—tolerances or finishes—we may be able to help you. There's no obligation—write us today.

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Form Cutters for Helical Gears...II

gear literature is the fact that it involves the cutter pitch diameter. This varies with the diametral pitch and with the various manufacturers. It is not generally known to the tool designer or anyone except the man in the shop who actually gets the cutter from the tool crib. Then it is too late to do anything but "cut and try."

This difficulty can be eliminated by establishing an empirical relationship between the cutter diameter and diametral pitch. Spur cutter sizes can be directly related to diametral pitches, even though such a relation may not be intentional on the part of the manufacturer, because the proportions of the tooth form and the size of hole required almost automatically dictate the "natural" size of the cutters. A curve of this relationship, together with an empirical formula, is shown in Fig. 1. Even though the individual cutters may deviate slightly from this curve, the errors caused by the deviation are far smaller than those resulting if the effects of cutter diameter are ignored altogether.

The combined relationship of the product $P_n D_c$, which appears in the exact equation (2), to the diametral pitch is shown in the curve and empirical formula of Fig 2. This curve and Equation (2) are sufficient for all calculations in the range of pitches from one to 20. A combined formula which may be used alternatively if Curve (2) is not available is

$$N_c = \frac{N}{\cos^3 \psi} + P_n \left(\frac{14.5}{P_n + 1.8} + 1.1 \right) \tan^2 \psi \quad (3)$$

A comparison of the values obtained by the use of Equations (1) and (3) for one particular case—10-tooth, 6-pitch gears of various helix angles — is shown by the curves of Fig 3. These curves show that the exact formula gives a better choice of cutter number for all helix angles above 17°.

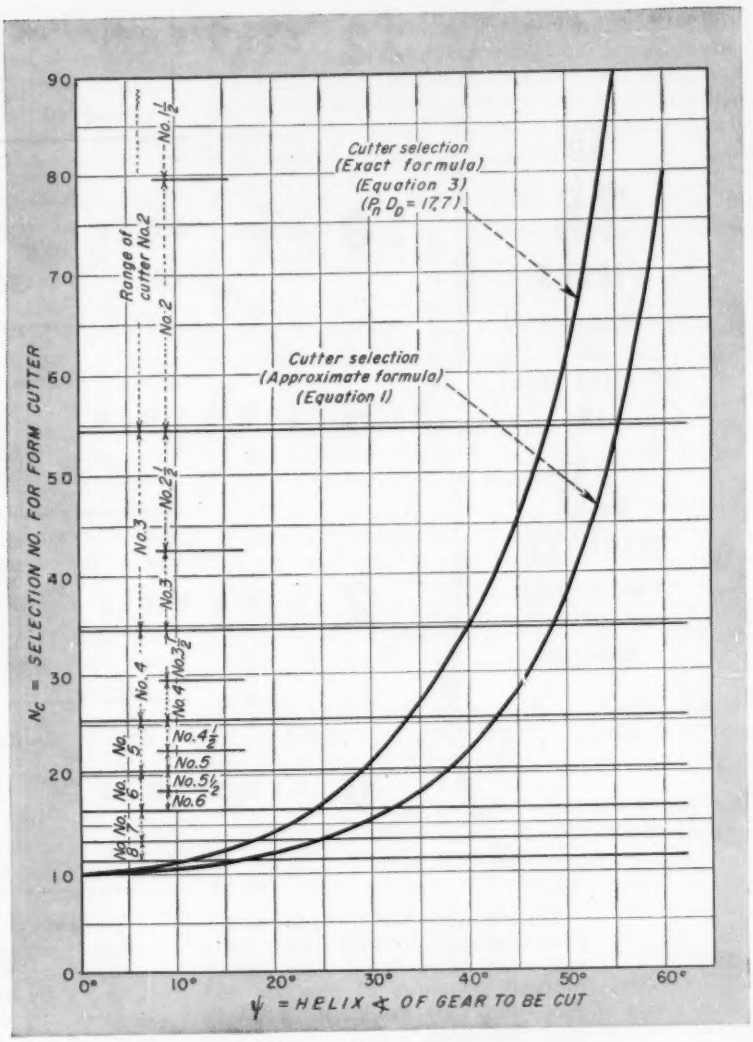


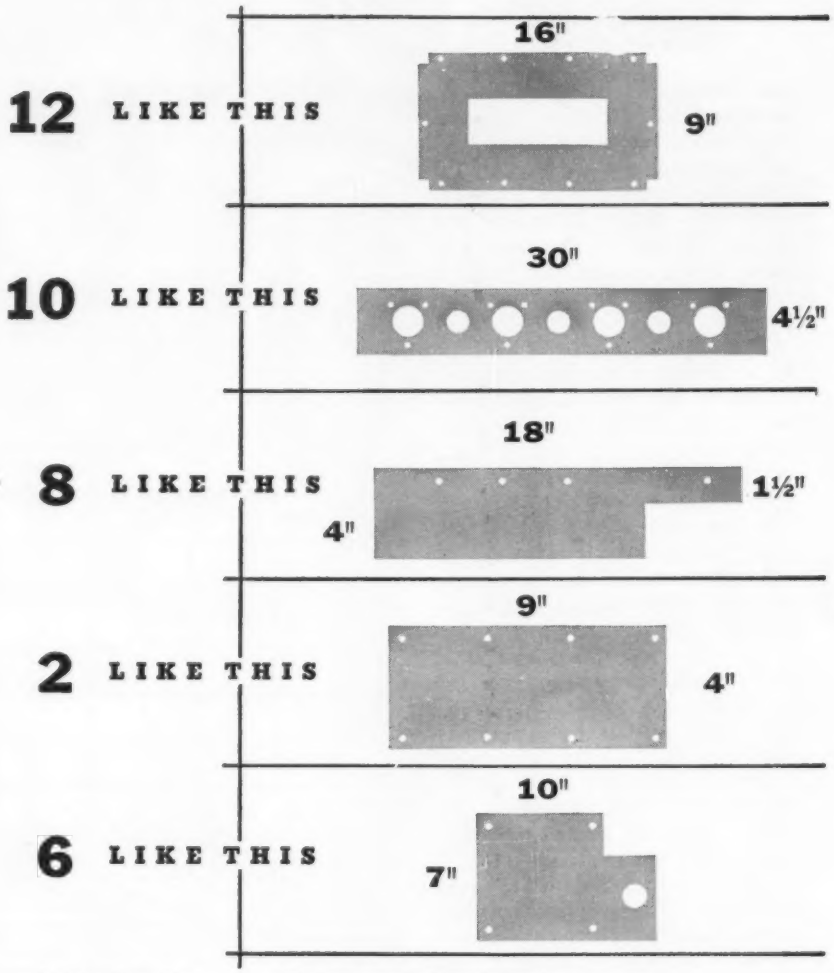
FIG. 3 ... Curves for 6-DP gear, 10 teeth, showing the variation in form-cutter number determined by the exact and approximate selection formulas

with a WIEDEMANN you can

Reduce INVENTORY & STORAGE SPACE!

produce parts as required.

All
38
PIECES
were pierced in ⅛" mild steel
IN
28
MINUTES
(including all set-up)



The company producing the above parts has eliminated inventory of these and many other items; has greatly reduced inventory of punches and dies—and they no longer need to stock templates.

The Wiedemann method enables them to ship parts directly to assembly rather than the stockroom.

Items are produced weekly or more often if necessary. Sizes of parts pierced on the Wiedemann range from 5 ft. by 10 ft. down to 2" squares.

Inventory and storage reduction are just two of many cost-reducing features of Wiedemann Turret Punch Presses. We'll gladly make a time study on your own work.

WIEDEMANN MACHINE COMPANY

4217 Wissahickon Avenue, Philadelphia 32, Pa.

Check List for Machine Care

By FRANK BIECHELE, Foreman, SERGE ELEVATOR CO, NEW YORK 51, N Y

These thirteen suggestions were originally prepared to tell operators exactly what was required of them to keep their machines clean and safe. The suggestions worked so well for the author that we are passing them along to you

1 MACHINES should be cleaned after every job, particularly when a different material is to be machined.

- Wipe machine ways clean.
- Oil all bearings.
- Oil machine ways *except* when machining cast iron.
- Wipe off excess oil from housings, handles, other surfaces.

In cleaning machine ways, slide should be oiled, then moved back and forth, each time wiping off dirty oil and adding clean oil until oil remains clean. (This should not be necessary on a machine that is properly cared for.) After ways are cleaned and oiled, slide should remain in one position and all oil should be wiped off exposed surfaces of the ways.

When cutting cast iron, extra care should be exercised to see that there is no surplus oil on wearing surfaces, as it tends to form a lapping compound with the cast-iron dust. All sliding surfaces should also be kept clear of small chips while machine is working.

2 V-BELTS should never be too tight. Enough slack should be left to allow a quarter-twist in the belt. Tight V-belts overstrain motor and machine bearings.

3 STOPS should be set on drillpresses to prevent drills from entering machine table. Otherwise table may be ruined so badly that it is impossible to drill a true vertical hole.

4 WHEN machining cast iron in a chuck, a rag should be stuffed into the chuck to prevent cast-iron chips and dust from entering the moving parts of the chuck. When this happens, the chuck becomes jammed and can be permanently damaged by forcing the jaws. If a chuck seems hard to open or close, report the situation to your foreman immediately.

5 USING a piece of pipe on a chuck wrench is a major crime against your equipment. It overstrains the scroll, jaws, and leadscrews beyond repair. A chuck will probably never run true after this has happened. The length of a chuck handle is designed to provide the maximum safe leverage.

6 NEVER leave a chuck wrench in the chuck. If the machine is started you and your machine may be seriously damaged.

7 REPORT any uncovered oil holes in machine to your foreman. Grit and chips entering such holes will quickly ruin bearings, gears, and shafts.

8 KEEP machine equipment, such as chucks, faceplates, centers, wrenches, sleeves, straps, and studs in the locker or bench provided for them, rather than scattered around on the floor.

9 NO metal equipment or workpieces should be left on machine ways or work surfaces to cause dents, scratches, or marring of these surfaces. If it is absolutely necessary to rest the work on the ways, be sure a piece of wood or soft material is placed between the two metal surfaces.

10 IN mounting a chuck or faceplate on a lathe, be *absolutely* sure that threads and hub faces are *absolutely* free of dirt and grit.

11 WHEN hoisting heavy work out of a machine, be absolutely sure that the work is free and clear of clamps, hold-down devices, lathe centers, and chucks. Any upward pull on the machine will cause, at the least, misalignment of ways, upset level, and possibly cracked machine castings.

12 WHEN turning between centers, leave centers fairly loose while roughing. On long heavy cuts, where heat causes expansion, the centers should be checked frequently, without interrupting the cut, by loosening lock, and turning handwheel in until you feel the center hit bottom, then backing out a trifle. Center should move in, or it is too tight.

13 NEVER rough and finish one portion of the work and then go on to rough and finish another. Always do all roughing cuts before making any finishing cuts.

"Rigid tooling pays off," says Stainless Sam

When milling stainless steels, especially the tough higher-alloy types, make sure that your milling cutters are well-supported and rigid. This will help prevent chatter marks on the work, prolong tool life.

Fig. 1 shows a good set-up of a slotting cutter. Backing-up plates should be as large as the depth of the cut will permit. Heavy spacing collars help reinforce the arbor.

Fig. 2 shows a pair of straddle milling cutters provided with heavy steel discs backed snugly against the cutters. With this set-up close tolerances are possible. The discs not only give rigidity but add a desirable flywheel effect.

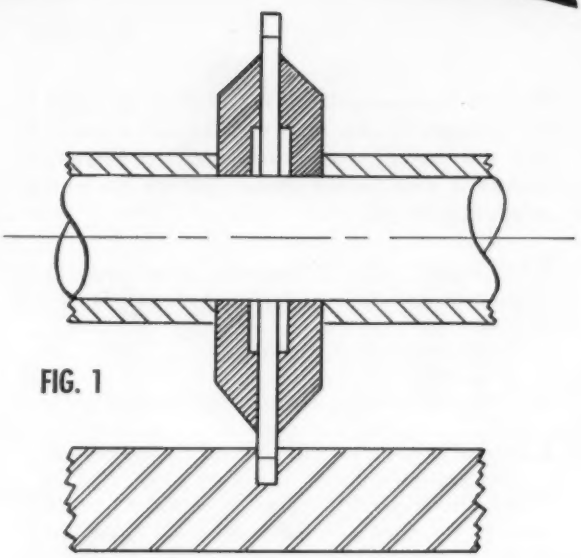


FIG. 1

Permit increased speeds

With rigid milling cutter set-ups full recommended speeds and feeds can be maintained. Speeds can be increased considerably when long production runs warrant the use of carbide tooling. Then cutter backing must be substantial to take full advantage of high-powered heavy-duty equipment.

Nickel-bearing grades available

Armco Stainless Steel bars and wire in the nickel-bearing types are now available for use in any products or equipment. Tell us what you need or let us work with your engineers. We can give you good delivery on both chromium and chromium-nickel grades.

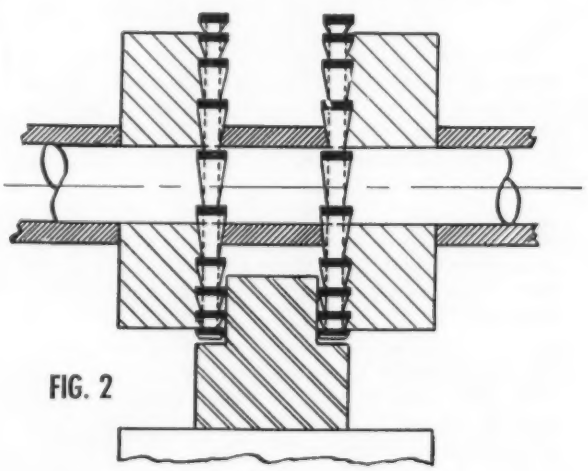


FIG. 2

ARMCO STEEL CORPORATION
1474 CURTIS STREET, MIDDLETOWN, OHIO
EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

TALKING SHOP

Reamer to Broach

SCRAPPED REAMERS with chipped or worn flutes are being reworked into draw broaches at Temco Aircraft Corp, Dallas, Texas. The broaches are drawn through open holes to size them, just as the reamers are rotated in blind holes for the same purpose. Two men combined to present the idea. P F Young, machine-shop supt, suggested broaches with spiral instead of circular lands, so normal thread grinders could be used to sharpen them. Then H W Nowell, assistant foreman under Mr Young, proposed the use of scrapped reamers for broach stock.

Procedure is to grind a scrapped reamer on a cylindrical grinder to desired diameter plus grinding tolerance (for example, a ⅞- or ¾-in. reamer for a ½-in. broach). The taper shank is also found to fit a broach adapter. Then four 2-tpi lands are cut on a thread grinder. Each has a 45° secondary clearance, and a 7° primary clearance on cutting edge. Taper is 0.001 in./in. except for the top inch, which is straight to provide burnishing action. Tools shear but show no tendency to twist, and sizes from ⅜ to 1¼ in. in diameter have been made. Time from specs to finished broach is 4 hours.

Open Wider!

TWO MEN at Convair San Diego have borrowed a dental idea—using dental plaster instead of metal for locater pads that maintain pre-set dimensions in fixtures and tools. The plaster, supplied as a flour, is mixed with water to form a dough that is easily shaped and sets quickly. It will withstand more rough usage than metal, can stand pressures up to 11,500 psi, and expands only slightly during drying. The suggestion award was for $691.

Plastic-steel Sandwich

VINYL-PLASTIC coatings laminated to sheet steel or aluminum may provide a new finish for these metals for both consumer products and industrial applications. Under development by US Rubber, the laminate is made by rolling vinyl sheet onto adhesive-coated metal sheet or strip. After rolling, heat lamps seal the special adhesive. Tests of the laminate are said to indicate a bonding strength of better than 40 psi, permitting subsequent bending, drawing, shearing, drilling, or punching without damaging the coating. Cut edges of finished products can be protected with pressure-sensitive tape or vinyl resin coatings. Plans are to license the process.

Battery Cell Trick

INDUSTRIAL TRUCK BATTERIES frequently give out in one cell while the other cells are still in good condition. After the bad cell has been repaired, it should receive a longer charge than usual to restore it to normal condition. If special equipment for this is not available, or the battery cannot be spared from service, Gould-National Batteries suggest this procedure:

Build up the posts of the repaired cell and the adjacent cells but do not install the connector bars. Connect the cell into the circuit for night time charging with jumpers of No. 4 rubber-covered cable that have standard automotive battery clamps soldered on each end. When the battery is in use during the day, switch the jumpers to connect adjacent cells, leaving the repaired cell out of the circuit. When the cell has received enough extra charging cycles to hold a constant reading for four charging hours, the specific gravity of the cell should be adjusted and the connector bars can then be replaced.

5 Years, Not 5 G's

MACHINE-TOOL SWINDLE tried once too often has just landed a confidence man in the pokey for five years. Seems this fellow showed up this summer at a used machinery dealer's New York showroom. Said he had bought several standard machine tools and had taken them to Europe for one of the tool shows. Said he sold some of them but because of a foul-up in currency exchange, couldn't collect enough money to get the remainder back through US Customs in New York, where they were impounded in a warehouse. "Now," said the con man, "You let me have $5000 or so. I'll get the machines out of hock to the Government, turn them over to you, and you sell them at double or triple your normal profit." There's one born every minute (proof: someone collected close to $100,000 a few years back for the "benefit of the widow of the Unknown Soldier")—so the dealer fell for it, handed over the dough, and that was the last seen of the fast-talking swindler. Machinery Dealers' National Association got wind of it, sent out a warning to members in a monthly newsletter. Sure enough, just recently an impressive-looking gentleman, extremely well-versed in machine-tool specifications and the foreign market, showed up in the offices of a Syracuse, NY, dealer. He had a very sad story to tell. Seems he bought several machine tools, took them to a European show . . . the dealer had read the newsletter. Our glib friend was asked to repeat his sad tale to the police. Got five years for it instead of 5G's.

Kearney & Trecker to Lease Entire Line of Standard Machine Tools Under 7-Year Optional Purchase Plan

MILWAUKEE—Kearney & Trecker Corp has announced plans for leasing standard machine tools over a seven-year period, with the customer having the option to purchase the leased machines or to terminate the lease agreement after the machines have been in use a specified length of time. The customer may choose from one of three plans.

Three Plans Offered

Each plan basically is a seven-year lease arrangement, but the three differ in the options permitted. Plan A offers the customer the right to terminate the lease at the end of the third year or any time thereafter, or to buy the machine at a specified percentage of the original list price at the end of the third year or any time thereafter.

Plan B gives the same privileges of termination or purchase — but at the end of the second year. Plan C does the same thing at the end of the first year.

Rental charges under Plan A are 25% of the list price for each of the first three years. Plan B follows a 30-25-20% gradation in rentals for the first three years, and Plan C a 35-25-15% scale. All three plans specify a rental charge of 10% a year during the last four years of the seven-year lease agreement. Rentals are paid semi-annually in advance. Kearney & Trecker retains title to the rented machines.

The similarity among all three plans is that the rentals paid and the price at which the machines may be bought are exactly the same at the end of the third year.

Not a Tax Evasion Device

Kearney & Trecker made plain one point in connection with the tool-lease plan—it is not sponsoring a tax evasion device whereby a conditional sales agreement may be a lease, or whereby a shift or deferment of tax liability not now contemplated by Bureau of Internal Revenue regulations would be achieved. The customer will have to judge for himself until such time as the Bureau of Internal Revenue gives an opinion, the advantages of the lease and deductibility of the rental.

The tool-lease plan offers certain benefits to customers, Kearney & Trecker declares. For one thing, working capital can be used for purposes other than purchases of production equipment, and production can be enlarged without incurring further debt. It also assures customer of the use of a machine as long as it is needed, without committing him for the total life of the machine, thus avoiding the risk of high obsolescence.

What's more, a customer can make a one-year or longer trial installation of a machine and judge its merit on actual performance in the shop before purchasing.

The tool-lease plan applies to all Kearney & Trecker standard knee-type and bed-type milling machines and precision boring machines. Special lease agreements, different from those announced for standard machines, will be considered for either special machinery or applications of heavy-duty, bed-type machines.

Kearney & Trecker feels that the plan has the advantage of placing control of the machines in its hands upon expiration of the lease. At that time, the company will decide whether to sell the used machines "as is," or to rebuild, or to hold for a better market.

The proposed plans do not cover special tooling or attachments which are removable from the machine. If a machine is turned back under the lease agreement, the customer is expected to return it in good condition, with allowance for normal wear and tear. While the machine is in his shop, he is obligated to maintain it as though it were his own machine.

Francis J Trecker, president of Kearney & Trecker, points out that the tool-leasing program is designed to spur modernization of metalworking plants.

"The inescapable facts of rising costs in both materials and labor, and the resulting narrowing of profit margins," Mr Trecker said, "requires industry to survey in detail its complete manufacturing facilities in order to replace obsolete and inefficient equipment." Mr Trecker pointed to the 1953 *American Machinist* Inventory of Metalworking Production Equipment as proof of the need for stimulating replacement of old machines with new.

Kearney & Trecker has had an experimental leasing arrangement of standard milling machines with several customers since 1949, Mr Trecker declared. The plans just announced are based on this tested program.

KEARNEY & TRECKER TOOL-LEASE PLANS

	PLAN A		PLAN B		PLAN C	
Years	Rental	Purchase	Rental	Purchase	Rental	Purchase
1	25%		30%		35%	80%*
2	25%		25%	60%*	25%	60%
3	25%	45%*	20%	45%	15%	45%
4	10%	40%	10%	40%	10%	40%
5	10%	35%	10%	35%	10%	35%
6	10%	30%	10%	30%	10%	30%
7	10%	25%	10%	25%	10%	25%

* The customer may purchase or terminate at the end of the designated (*) year, or any year thereafter.

MACHINE-TOOL LEASING PLAN A

(List Price of Machine — $10,000.00)

Years	Amount of Rental	Total	Purchase Option Price
1st yr	2 payments of $1250	$2500	—
2nd yr	2 payments of 1250	2500	—
3rd yr *	2 payments of 1250	2500	$4500
4th yr	2 payments of 500	1000	4000
5th yr	2 payments of 500	1000	3500
6th yr	2 payments of 500	1000	3000
7th yr	2 payments of 500	1000	2500

* Customer may terminate or purchase anytime after third year.

Battle for Auto Market Supremacy Sets Rumors Flying Around Detroit

DETROIT—Speculation and rumors are flying thick and fast around Detroit since the recent Nash-Hudson merger. For one thing, many automobile men think it won't be long until the Hudson nameplate will be dropped entirely — even though A Em Barit, director and consultant to the new American Motors Corp apparently won out over Nash-Kelvinator President George Mason's idea of abandoning the Hudson Jet because it is directly competitive with the Nash Rambler.

Another local speculation is that Kelvinator will go after government electronics business, and may enter production of television and radio sets. In this way, Hudson's obsolete and inefficient plant could be converted to electronics, TV and radio output.

Knowledgeable outsiders say that Hudson's marriage to Nash-Kelvinator apparently was of the shotgun variety—that Hudson's days were numbered, and that the merger was the only way of keeping the company afloat. Meanwhile, American Motors management is as tight-lipped as a Russian diplomat about its outlook and plans.

Packard to Join AMC?

The merger leaves only Packard and Studebaker as single-line independents. Packard has been and still is receptive to merger proposals. A good bet: before the year is out, Packard will join American Motors.

In the wake of GM's announcement to spend upwards of $1 billion for new tooling, rumors are springing up around Detroit to the effect that Chrysler may be looking for new financing, particularly since its $35 million purchase of Briggs Mfg Co, and that a bond issue may be floated.

Ford has completed its 18-month expansion and modernization program at its Canton, Ohio, forge plant. The plant was enlarged 66%, or 127,400 sq ft.

Programming and planning by GM and Ford leaves Chrysler and the independents wondering where they fit into the 1954 market. Henry Ford II recently said his company plans to build more cars this year than ever before, and thinks Ford will take 30% of the 1954 market—a 5% gain over 1953.

If Ford achieves 30%, and it well might, plus 45-50% for GM, the remaining 25% will have to be split many ways. Last year, Chrysler produced over 20% of the total, expects to do more this year. Studebaker expects to increase its share to at least 4.5% this year. Added up, this total leaves exactly zero to Packard, American Motors Corp, and Kaiser Willys. And it leaves a lot of people wondering what brand auto chieftains have been smoking.

AIRBORNE MACHINE-TOOL EXECUTIVES will be the order of the day at Jones & Lamson Machine Co, Springfield, Vt, which has just purchased a twin-engine Aero Commander to fly its executives around the country. Inspecting the plane are left to right: Pilot Harold Buker, President H L Andrews, Co-Pilot Gene Guild, and Sales Manager J C Hebert

PRESSED METAL INSTITUTE EXPANDS TECHNICAL SERVICES

CLEVELAND—Pressed Metal Institute will shortly launch a four-point expansion of its technical services to member companies, it was announced here by Warren A Peterson, Peterson Products Corp, Chicago, chairman of PMI's Technical Research and Standards Committee, meeting here January 15.

Four-Point Expansion

The expansion will include: (1) preparation of data sheets on various stamping production procedures: these to be eventually incorporated into a book; (2) publication of a monthly magazine, *"Technical Topics,"* beginning in February; (3) preparation of a manual on statistical quality control in stamping plants; and (4) establishment of a technical library at PMI's Cleveland headquarters.

Number 1 project in the expansion, preparation of data sheets for an industry handbook, will cover such stamping phases as sheet and strip material, stamping standards, presses and press selection, materials handling, lubricants, dyes, welding, brazing, drawing.

Three other important problems will get immediate technical attention from PMI: (1) flow of sheet metal—thinning, wrinkling and springback, (2) die design in relation to metal flow, and (3) metal quality specifications on incoming raw materials. First research data is expected in two to three months.

To Publish Technical Monthly

PMI's new monthly *"Technical Topics"* will have a twofold aim—to discuss current stamping problems, and to publish a bibliography of industry literature.

PMI's quality control manual is still in initial stages, with no publication date set.

The Institute will hold its Fifth Annual Spring Meeting at the Hotel Carter here March 17-19. Chief topics for discussion will include: stamping plant safety, progress and possibilities of using plastic dies for stamping, process material handling and resistance welding. Cleveland area plant tours will be conducted at Lincoln Electric, Chevrolet and Republic Steel Corp.

PMI has added a New York district to its roster, making nine altogether, and plans to hold a technical meeting in each district once a year, PMI Technical Director Robert W Breckenridge announced.

Prescription for Prosperity: Timely Replacement Of Capital Equipment, New York Engineers Told

NEW YORK — Key to industrial prosperity in the face of increasing competition is the timely replacement of capital equipment—modernization of facilities at a time when new equipment will earn more profit than old equipment after all expenses and charges. This is the "Prescription for Prosperity" given by Ralph E Cross, executive vice president, The Cross Co, Detroit, at a meeting of the Greater New York Chapter of the American Society of Tool Engineers here January 11.

"Whether we fall into a depression or go forward into an era of great prosperity will depend entirely on how well we understand the workings of our American Productive System," Mr Cross said.

Controlled Competitive Action

Competition, he added, is only one of the reasons for America's high standard of living. To be effective, competition must effect action in the right direction at the right time, he said.

For example, in the automotive industry competition forces changes to new models, plus all the things that go with them—new plants, new tooling, new advertising and sales campaigns, etc. Auto men must anticipate public tastes. If their decisions are poor, or if they move too fast or too slowly, thousands of people are thrown out of work and a contribution has been made toward a recession. But if decisions are right, prices drop, wages go up, more people are employed and a contribution has been made toward prosperity.

But, Mr Cross added, competition all too often doesn't work as simply as that in all industries, and it is no easy job to keep a business operating at a high level of prosperity. As competition forces change, risks must be taken involving large capital expenditures, risks that more often than not involve the difference between success and failure.

But today's progressive firms have found the answer in what is called modernization analysis, or replacement analysis. Departments have been set up to take the guesswork out of management decisions. These departments arrive at good modernization timing by plotting the profits from a manufacturing process from installation to the time when it is no longer profitable (decline of obsolescense) against the profits per unit that might be derived from installation of the most up-to-date process available at the beginning of each year. Thus the best year for modernization is the year in which the lines intersect.

Two things are necessary to put a company's modernization an a business-like basis, Mr Cross said:

- **A definite policy.** This should include at least a statement of the intent to replace or modernize capital equipment as rapidly as is economically practicable, and a statement of intent to review all capital equipment at regular intervals.
- **Established procedure.** Here the underlying principle is selection of the plan, machine or process that will produce the largest profit. This is best accomplished by comparing the merits of several different proposed plans of operation over a year's time.

In line with the latter, one of the best and most easily understood methods of making comparisons is to project a profit and loss statement.

Take for example, Mr Cross said, three plans for producing oil pump bodies (see table), where production is set at 1.25-million pieces per year and estimated life of the process is 8 years.

Assuming that annual sales, using any of the three plans, is $1.025 million, cost of sales (materials, labor and expenses, including depreciation) of each plan is subtracted from annual sales income, to give the gross profit. Subtracting sales and administration expenses from this gives the profit before taxes. When estimated federal taxes are subtracted, the result is net profit.

Comparison by this method shows that Plan 2, while requiring the largest capital expenditure, is the best investment. After all expenses are deducted, it will earn $69,358 more than Plan 1 (no capital investment) the first year of operation. and it will earn $10,332 more than Plan 3 after expenses. Thus, if management decides to invest in Plan 3 rather than in Plan 2, it loses $10,332 the first year and probably more each succeeding year. If it decides to keep the old equipment, it will lose $69,358 the first year, more each following year.

And with Plan 2, the company has $93,713 available from depreciation, plus $130,126 from profit—a total of $223,839 to repay its investment the first year of operation. Working capital can be restored in as little as 4.8 years.

Needed: a Crystal Ball

The problem of modernization resolves itself into one of forecasting operations 12 months in advance, Mr Cross said. Results will be only as good as these estimates and no more. Here the profit and loss statement, which is a complete list of every operational expense, must be the check list against which all moves are balanced.

The first step in making a projection is to have a complete list of accounts, starting with an estimate for sales and going right down the line through every item until the profit is estimated.

Next, time required to change tools is estimated. The estimator's job here is to figure tool life and time needed to change individual tools, then multiply the estimates of all the machines to provide a sound basis for selecting number of setup men needed. Similar procedures are used for perishable tools and tool grinding.

Depreciation then must be estimated. This requires careful consideration, Mr Cross said, because it must recover the investment within the estimated life of the process. And

AUTOMATIC PUNCH PRESS

NEW YORK—An automatic punch press controlled by an electronic digital computer has been developed by General Electric at its Electronics Laboratory. Hole positions as x and y coordinates are punched in a program card (average time 30 min), then pneumatic and hydraulic cylinders position work accurately to thousandths. Principle can be widely applied. Full story in next issue.

PROJECTED PROFIT AND LOSS STATEMENT FOR THREE PLANS OF PRODUCING OIL PUMP BODIES

Production — 1,250,000 pieces per year
Estimated life of process — 8 years

	PLAN 1	PLAN 2	PLAN 3
INVESTMENT REQUIRED	None	1,071,000	850,000
Sales			
1,250,000 Bodies @ 0.82 each	1,025,000	1,025,000	1,025,000
Cost of Sales			
Material	396,000	396,000	396,000
Subcontracting	None	None	None
Direct Labor	187,268	53,328	79,592
Rework	1,500	495	825
Setup & Tool Change	7,434	3,638	5,139
Supervision	20,250	7,000	7,000
Labor Fringes	43,290	12,892	18,511
Floor Space	4,435	5,443	4,760
Power	3,475	6,000	5,100
Taxes	5,000	21,420	17,000
Insurance	1,791	3,750	2,975
Perishable Tools	27,050	18,750	20,100
Supplies	9,200	3,720	3,820
Scrap	26,060	13,480	18,300
Tool Grinding	13,320	7,750	9,630
Machine Repair	15,500	5,100	3,750
Lubrication	3,550	1,250	2,500
Depreciation	None	93,713	74,375
Miscellaneous	28,090	7,999	11,938
	793,213	661,728	681,315
Gross Profit	231,787	363,270	343,685
Selling Expense	66,625	66,625	66,625
Administrative Expense	43,627	36,395	37,472
Interest	None	None	None
Profit Before Tax	121,535	260,252	239,588
Estimate for Federal Income Tax	60,767	130,126	119,794
Net Profit	60,768	130,126	119,794

it must satisfy Bureau of Internal Revenue requirements. First, expected life of the process is estimated by (1) market potential, and (2) probability of obsolescence: and it should by no means be influenced by a desire for fast recovery of capital. Then, salvage value of equipment at the end of the process's useful life is added to estimated process life to serve as a basis for depreciation.

Using Plan 2 as an example, estimated life of process is 8 years, and estimated salvage value of equipment is 30% after 8 years of operation. Depreciation allowance is therefore ⅛ of 70% of the cost of the equipment.

In many cases, sales expense is merely a percentage of the sales dollar. This is the case where design, price and quality are all constant. But where these factors are not constant, they provide additional profit possibilities.

Administrative expense, like all other selling price factors, varies from one plan to another, Mr Cross said. A plan involving highly mechanized manufacturing requires less manpower, less records, etc.

An estimate for interest should be included only when it is necessary to borrow money to carry out the plan. And this must not be confused with interest or return on the investment.

Although it is by no means the only way of planning for modernization, the projected profit and loss comparison's outstanding feature is that it neither adds nor omits any expenses or charges that would incur from modernization, Mr Cross stated.

With it, he said, management can quickly appraise the effects of changes in such factors as labor rates, taxes, etc. It can place a quantitative value upon the value of one plan over another: it can measure the cost of delaying modernization: and it assures getting the most out of capital expenditures. In short, Mr Cross concluded, it provides a "prescription for prosperity."

ARMY CUTS AUTOMOTIVE PROCUREMENT SHARPLY

WASHINGTON—Major cutbacks in defense contracting, in line with military strength reductions for the coming fiscal year, have already taken place. The Army has announced a $140-million cutback in procurement of jeeps, trucks and trailers.

Previously, contracts for automotive equipment, including tanks, were to have been phased out in fiscal 1954. But the new order lops off these contracts, rather than letting them run to completion date.

Major Producers Affected

Affected by this are General Motors, which will wind up 2½-ton truck production by the middle of this year instead of March 1955; Willys Motors, which will wind up jeep production this summer, not in spring of 1955; Dodge Div, Chrysler Corp, sheduled to wind up ¾-ton truck output by July instead of mid-1955: and Checker Cab Co and Fruehauf, both of whom will immediately cut army trailer production a third, will conclude their contract this summer, instead of next fall.

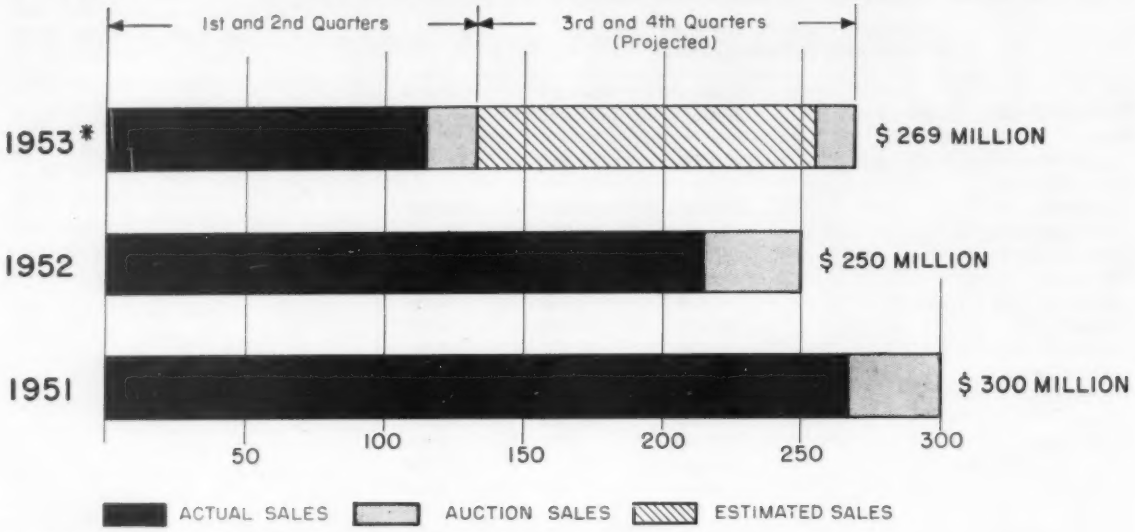
In Line With Wilson Program

The Army defense cutbacks follow the line laid down by Defense Secretary Wilson last fall, when he said procurement would slow down or halt on items sufficiently stockpiled by the services. At the time, this was taken to mean almost all automotive equipment, tanks and ammunition.

The services in the next 18 months are expected to drop at least 400,000 men and dig into stockpiles for current supplies. And soft goods contracting will virtually cease. Thus the Defense Dept hopes to cut down some of the $86 billion tied up in major military procurement programs, in order to achieve the $5 billion spending cut schedule for 1955.

More Cuts to Come

Other contract cancellations loom. The already-stretched-out tank program will be sliced deeply before contracts are concluded sometime next year. And gradually lessening ammunition contracts will get further cuts by early spring. Nevertheless, Defense Dept officials claim contract cancellations won't effect the national economy much. Their reasoning: defense contractors were expected to wind up production soon anyway. All the new orders do is push up the date six months to a year.



ESTIMATED SALES OF USED MACHINERY 1951-53. Source: National Machinery Dealers' Assn

Used Machine Tools Are Big ($300 Million a Year) Business, First Published Estimates Show

NEW YORK — The used machine-tool business has become a major factor in US industrial economy in recent years. The growing importance of the used machinery business in recent decades is borne out by dollar volume figures compiled and made available for the first time in the industry's history by the Machinery Dealers' National Association.

The Association, basing its dollar volume totals on a survey of 85 leading dealers, then projecting the volume of those dealers into an estimated 700 total dealers in the United States, has shown that US dealers have done as much as $300 million business in peak years. This is exclusive of new machine sales by used-new dealers, dealer-to-dealer sales, and commissions for assisting consumer-to-consumer sales.

Peak Sales in 1951

Sales of used machine tools reached their postwar peak in 1951, when dollar volume is estimated to have been $262.5 million, plus some $38 million worth of machine tools sold at auction, bringing 1951 total sales to $300 million.

Using the same projection of figures reported by 85 companies in 1952 into the volume of 700 total US dealers, MDNA figures show that about $223.8 million worth of used machine tools were sold by dealers, plus another $25 million sold at auction, for a total of about $250 million.

Sales for the first and second quarters of 1953 were $7.5 million and $7.1 million, respectively, indicating a slight upturn over comparable periods in 1952. Total sales figures for the third and fourth quarters of 1953 will shortly be made available by the Association.

These totals, available for the first time, make it evident that the used machinery industry is big business, and an increasingly important factor in US industry. And the used machinery business performs two vital services for the metalworking industry, according to an MDNA spokesman:

- It helps many small metalworking firms to get a start with comparatively inexpensive equipment. Later, these same firms will graduate to new equipment, thus broadening the market for new machine tools.
- The used machinery dealer provides the user with a sales outlet for his used machinery. Without this outlet, many or most metalworking firms would be unable to help pay for new machine tools by selling their used tools.

Appliance Firms Plan Major Expansions

MANSFIELD, OHIO—Westinghouse Electric Corp will spend upwards of $2½ million on rearranging and expanding its Appliance Division plant here as the first step in a company-wide program to double output of several of its major appliance lines.

More than $2 million of the outlay will be for new machinery and equipment to replace machinery now being shipped to Westinghouse's new Columbus, Ohio, plant.

Equipment and machinery will be purchased for production of Corox heating units, thermostats and major appliances.

CHICAGO—More-than-doubled production of automatic clothes washers and electric clothes dryers is expected to result from extensive modernization of Hotpoint Co's plant here, built in 1918.

Although overall area of the present plant will not be upped from its present 500,000 sq ft, cubic area will be more than doubled. New machine tools and overhead conveyors and other modern methods of moving components and assemblies, already in use in Hotpoint's refrigerator and range plants, will be adapted to laundry appliance manufacturing.

US Top Management Team Finds West Berlin Metalworking Long on Technology, Short on Marketing

NEW YORK—Elimination of all inter-European trade barriers and free convertibility of currencies are essential to the economic and political stability of Western Europe. That is the opinion of A V Bodine, president, Bodine Corp, Bridgeport, Conn, who recently represented the machine-tool industry on a four-man top management team invited on a month-long tour of West Berlin industry by the Berlin Chamber of Commerce and Industry, under US State Dept auspices. In addition to Mr Bodine, the team consisted of representatives from the appliance, printing and clothing industries.

Western Germany as a whole has shown remarkable economic recovery since World War II, but this is not true of Berlin, Mr Bodine reports. Western Germany today has an economy index of 151 (1936 = 100), compared to Berlin's lowly 61.

But, he says, "for their courage, faith, diligence and hard work, we greatly admire West Berlin leadership. Many factories were rebuilt by management and employees working together without pay. We met with enough businessmen to know that West Berlin does not lack the aggressive leadership so necessary for the tasks that lie ahead. We have seen examples of the best and worst American practices . . . In apprentice training, social programs for employees, use of blind and disabled persons, manufacturing methods and plant layout, Berlin has many outstanding examples unsurpassed in the United States."

But, he adds, in the areas of wages, hours, labor union relations, product design, market development, selling techniques and consumer research, Berlin is at least 20 years behind the United States.

Hold Management Seminars

Each of the four visiting US experts conducted 16 four-hour seminar sessions for the benefit of top Berlin executives in their particular fields. In addition, plant visits and individual conferences were crowded into the team's five-week schedule. In Mr Bodine's specific field, machine tools, he reports:

"All of the plants we visited were new or recently reconstructed. Most equipment was new and in general better-than-average in comparable US plants. Most equipment was acquired through Marshall Plan funds . . . The machine-tool industry is expanded far beyond any normal market requirements, and must prepare to add consumer durable goods or similar lines.

"We saw very many clever and ingenious uses of machine tools to accomplish certain operations. The principal difficulty, however, is that there are not enough orders to keep these plants busy. Nor will there be in the foreseeable future. Generally, the design of the machine-tool product is good. It is lighter than our American practice, and in that area could be improved. Quality control is outstanding and the finished product shows the result of superb skill and master craftsmen."

Another phase of metalworking, as reported by a fellow team member, Vale E Freeland of Westinghouse Electric Corp, deals with the electrical appliance industry, or lack of it, in Berlin. According to Mr Freeland, practically no electrical appliances are manufactured in that city. This industry has a tremendous potential, hampered by the fact that the average German has practically no money left after purchasing the necessities of life. Otherwise, an aggressive campaign to liberate the German housewife from drudgery through use of appliances could open a tremendous manufacturing field.

Here again, American technical assistance teams could be of great help in providing product designs acceptable to the German consumer.

FIRST TRAVELING 3-D MOVIE THEATER is included in demonstration coach previewed in Cincinnati Jan 14 at Cincinnati Lathe & Tool Co's dealer meeting. CL & T's "Magic Carpet" coach will soon visit metalworking plants coast to coast on a campaign for replacement of obsolete machine tools. The coach features a 3-D projector and screen, an engine lathe and several drill presses, all powered, and panels showing data on average age of machine tools, taken from *American Machinist's* Seventh Inventory of Metalworking Equipment. Left: Sales Manager Mason Britton, Jr, enters the coach. Right: AM Associate Editor Ben Brosheer (left) gets details on the nationwide tour from CL & T Vice President and General Manager G C Taaffe and Chicago Dealer Harry Musson (in shop jacket)

James C Hebert

Robert O Beardsley

John E Barbier

Theodore C Koch

Names in the News

Jones & Lamson Machine Co, Springfield, Vt, has completed reorganization of its operations with the formation of three decentralized operating divisions, creation of a new post of manager of manufacturing, and the setting up of a marketing division. **James C Hebert** has been appointed manager of the Machine Tool Div; **Robert O Beardsley** is new manager of the Comparator Div, and **John E Barbier** heads the Thread Tool Div. **Robert S Jones** will direct overall manufacturing and labor policies. **Howard A Finch,** appointed manager of the Marketing Div, will be in charge of all district office organizations, agents, foreign and domestic distributors, public relations, advertising, market research and sales analysis, as well as all sales policies. **J Russell Knights,** presently manager of foreign sales, is returning from an extended survey of European markets, and will join Mr Finch's staff to continue formation of a sales organization in that field. **Jordan D Wood,** manager of public relations and advertising, and **N R Kidder,** manager of market research and sales analysis, have been appointed to the staff. Mr Hebert has appointed to his Machine Tool Div: **Frank E Cheever,** manager of engineering; **Ray N Streeter,** manager of manufacturing; **Arch L Currie,** manager of sales for Fay and turret lathes; **Carl A Johnson,** manager of sales for thread grinders; **George R Morin,** manager of sales engineering; **Douglas C Handy,** manager of pricing; **Stephen B Williams,** accountant. Appointments to Mr Beardsley's Comparator Div staff are: **Leon B Fuller,** manager of engineering; **Arthur J Coakley,** manager of optical engineering; **Kenneth W Porter,** manager of manufacturing; **Harold L Murch,** manager of sales; **Michael A Leyden,** accountant. Staff members of Mr Barbier's Thread Tool Div are: **Sheldon E Ball,** manager of engineering; **Walter H Berg,** manager of manufacturing; **Robert O Martel,** manager of quality control; **Willis F Couts,** manager of sales; **Robert V MacKenzie,** assistant manager, sales; **Mark H White,** accountant. **David N Smith** has been appointed manager of engineering research.

Theodore C Koch, formerly vice president in charge of manufacturing of the Ace-Central States Machine Tool Co, Detroit, has been named general manager. The organization was formed in 1953 by Ace Tool & Die Co and Central States Engineering Corp. Both also continue as separate business entities and Mr Koch, in addition to his new assignment, retains his post as vice president of Ace Tool & Die.

Dan D Felske has been appointed vice president in charge of sales over all divisions of the Gear Grinding Machine Co, Detroit. His new duties will include the coordination of sales efforts of the company's grinding service and Geargrind machine divisions, as well as the Rzeppa universal joint division, which he formerly headed. Mr Felske has been with the organization for the last 33 years, serving in sales, management, and manufacturing capacities.

Robert S Jones

Howard A Finch

David N Smith

Dan D Felske

Edgar G Seybold

S B Withington

Andrew L Pontius

Henry H Howard

Edgar G Seybold has been elected president of The Hendey Machine Co, Torrington, Conn. Mr Seybold joined the company in 1937 as vice president and director, and for the past year has served as executive vice president. He succeeds **David Ayr,** who retired last October after heading the organization for 21 years. **F W Richmond** has been elected chairman of the board; **Helge G Hoglund,** vice president, sales; **Bernard Sassen,** vice president, engineering; **Arthur D Patterson,** secretary and treasurer; **Earl Betz,** assistant treasurer.

Robert E Morton has been named vice president and general manager of the Welding Div, Morton Mfg Co, Muskegon Heights, Mich. **James E Morton** has been appointed vice president and assistant manager; **Jack E Morton,** assistant secretary and purchasing agent; **Thomas H Morton,** assistant treasurer and manager of the Machine Key Div. **Oren G Rutemiller** is manager of sales and engineering; **Sherwood Basch,** acting chief engineer; **Kenneth Oslund,** chief engineer, Welding Div; **Harold Larsen,** production manager; and **W M Hovey,** coordinator of records.

Joseph A Cademartori, formerly superintendent of the Elmes & King Div, American Steel Foundries, Chicago, has been appointed general manager. He succeeds **Charles F Elmes,** vice president and general manager for the past eleven years, who has retired. Mr Cademartori has been a member of the organization since 1937. **George C Marakas** has been placed in charge of sales; he was formerly manager of Linco Axle sales for the Hammond, Ind, division. **Walther Rothacker,** who previously headed the methods and standards department, has been named superintendent.

S B Withington has been named president of the newly-consolidated Lycoming Div of Avco Mfg Corp. He will continue as general manager of Lycoming, and as a vice president of the parent company. Mr Withington, who joined Avco in 1948, will head operations in the division's two plants, at Stratford, Conn, and Williamsport, Pa. **Floyd J Bird** has been appointed vice president and plant manager, Williamsport; **Dr Anselm Franz,** vice president, turbine engineering; **Clarence J Mason,** controller; **James E Mitchell,** vice president, industrial relations; **Arthur Nutt,** vice president, engineering; **Donald F Turner,** vice president and plant manager, Stratford.

Andrew L Pontius has been named to head Illinois Tool Works' newly set up Standard Products Div. The company has decentralized its Shakeproof Div into three sections; **Carl F Jensen,** formerly plant manager of the division's Des Plaines, Ill, plant has been named to manage the Special Stamped Products Div; **Silas S Cathcart** has been appointed director of the Plastic Products Div. Mr Pontius was formerly works manager of Shakeproof.

Charles R Bender has been appointed assistant secretary of the National Tool & Die Manufacturers Association, with headquarters in Cleveland. A former tool designer, Mr Bender has been a chamber of commerce executive, and recently served as managing director of the Sidney, Ohio, Civic Association. In his new post he will be chiefly responsible for membership work.

Dirck Olton has been appointed manager of product engineering of Behr-Manning Corp's Abrasive Div, Troy, NY.

Henry H Howard has been elected a vice president of Caterpillar Tractor Co. His principal responsibility will be the administration of the company's recently created Engine Div. Mr Howard has been with the company for 27 years. He has served as manager of the Engine Sales Dept, general sales manager, director of sales, and last August was named manager of the Engine Div.

Louis Wozar has been appointed president and general manager of the Dayton Pump & Mfg Co, Dayton, Ohio. Mr Wozar joined the firm in 1948 as assistant to President **Frank M Tait,** elected chairman of the board. The new president was formerly associated with United Aircraft Products, Dayton, as general works manager.

Gustav A Schwenk, Jr, and **E K Mann, Jr,** have been named vice presidents of Bohn Aluminum & Brass Corp. Mr Schwenk has served as operations manager of the company since February 1953, and Mr Mann has been controller.

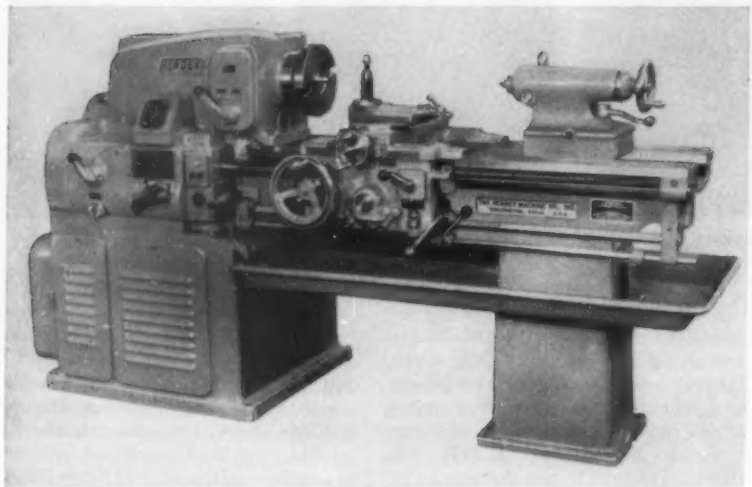
OBITUARIES

Lewis William Mesta, 63, executive vice president of Mesta Machine Co, Pittsburgh, died suddenly Dec 30. Mr Mesta had been associated for 45 years with the industrial firm founded by his uncle, George Mesta, in 1898. He served on the executive committee of the Machinery and Allied Products Institute.

Ransom Soper, 57, Long Island sales representative of Rudel Machinery Co, New York, died Dec 30 in Garden City, NY. Mr Soper had been associated with the machine tool industry since 1915, and joined Rudel in 1948.

(Continued on page 208)

New Shop Equipment



Electronic Motor Control Feature Of Hendey 14-In. Precision Lathe

Hendey No. 2E general-purpose precision lathe features infinitely variable spindle speeds with single dial control. Speeds can be changed while machine is under cut.

The electronic drive contains three 18-amp, heavy-duty rectifier tubes in the power circuit, and one smaller rectifier tube in the control circuit. Instantaneous electric dynamic spindle braking plus start, stop, and reverse are controlled by duplicated single levers at the headstock and apron.

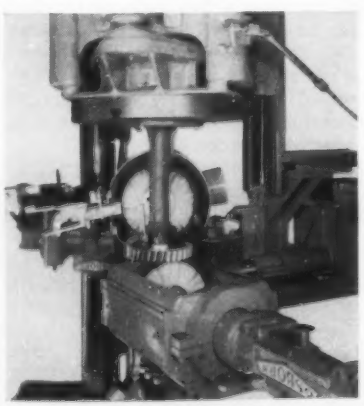
Positive belt drive is provided between motor and work spindle. Stepless speed ranging from 15 to 1500 rpm is provided by potentiometer control of both field and armature of the 5-hp dc motor. Extremely close speed control is reportedly achieved even under changing load. Full torque is attained at low speeds over the complete armature control range.

The electronic unit requires 220/400-v, single-phase, 60-cycle current. The motor is 230 v and requires a line load of 4.2 kva. Rectifier tubes are warranted for 3,000 hr. at full capacity.

The machine has a 14-in. swing and is available in several bed lengths; bed ways are hardened and precision ground. Other features included: reverse to the lead screw, automatic lubrication. 48 feed and thread changes, a sturdy V-type crossribbed bed, and convenient grouping of operating controls.

The spindle is mounted in preloaded super-precision roller bearings; spindle nose may be either L-1 taper nose or D-6 cam lock. The spindle hole is 1½ in. in diameter; lead screw diameter and pitch is 1¼ in., 6 tpi. Range of thread cutting is from 1½ to 92 in.

The Hendey Machine Co, Torrington, Conn



New Brushing Method for Burring Large Gears

A method for burring large-size gears and similar large products, using the Osborn Model No. 5 brushing machine with automatic features, is reportedly resulting in more than ten times previous work output. In addition to this step-up in production, the finished product is reportedly of much higher quality.

Reports of a case history from a leading manufacturer of jet engines indicate that one version of the brushing method was able to finish twenty 37½-in.-diameter gears per hour. This represented a 1000% production increase, and it is reported that two gears finished by the hand method in the same period of time would not pass similar inspection.

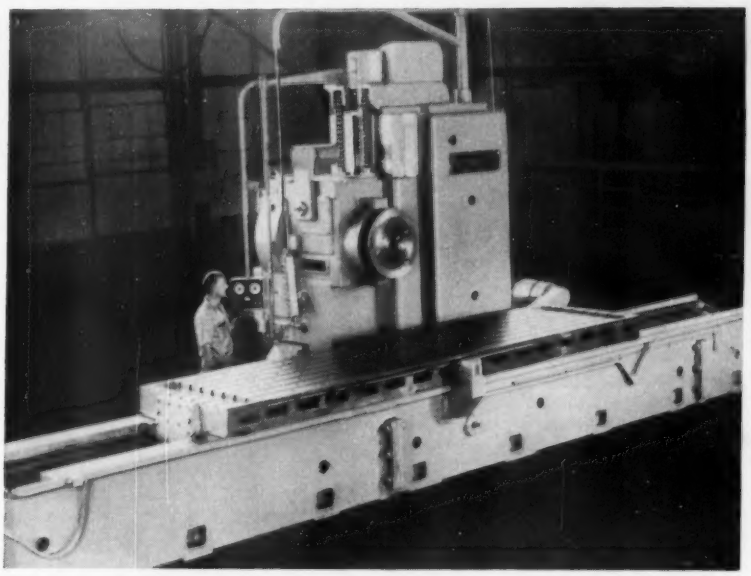
The Osborn Manufacturing Co reports the operation of this brushing machine is so easily learned that an unskilled operator can attain high-quality, rapid production quickly. The entire job of the operator is placing the gear on the turntable. As the brushed gear is removed, an unfinished gear is placed on the table. The table rotates the gear; a preset timer retracts the brushes and the motion is stopped until again actuated by the operator. The amount, direction, and quality of brushing each gear receives depends on the type of gear, metal, surface desired, type, and method of application of the brushes.

The company states further that brushes properly applied remove burrs and leave the part in better condition than do other burring methods. They need not produce a secondary burr or create two sharp edges in place of the one removed. While removing the burrs, brushes can simultaneously produce the smooth surfaces and well rounded edges which blend the joining surfaces. The fineness of the finish is determined by the type of brush and auxiliary compound used. The action of brushing is that of blending surface irregularities rather than actual removal of metal to form a part to dimension. Surface analyzer readings may show surface roughness of 24 to 35 mu-in. before brushing; the readings may be reduced to from 4 to 7 mu-in. after brushing.

The Osborn brushing machine is adaptable to many practical sizes of brushes and can be used on wide range of larger gear sizes.

The Osborn Manufacturing Co, Cleveland, Ohio

Materials and Parts



Sundstrand Rigidmil Obtains Automatic Square Cycle

Sundstrand has designed and built a larger Rigidmil. This machine is intended for heavy work, such as milling die blocks from rough prior to cutting impression, and removing the old impression before recutting on used die blocks. This new machine, Model 77, has vertical feed to the head in combination with longitudinal table feed so that an automatic square cycle can be obtained for rough milling of die shanks. A scale attached to the vertical head and an adjustable pointer on the bed are provided for setting up the automatic cycle or manually operating the machine.

The basic standard machine has a 48-in.-width table and can be furnished with feed strokes of 144, 168, 192, or 216 in. A variable feed drive is provided for both longitudinal movement of the table and vertical movement of the head. Meters in the pendant control unit indicate the rate of feed in ipm.

The spindle head is of the horizontal type and has either 60, 75, or 100 hp spindle drive motor. A meter on the control panel indicates the percent of full load current on the spindle motor. Speed changes are by pick-off change gears. A variable speed drive for the spindle head can be furnished as optional equipment.

Sundstrand Machine Tool Co, Rockford, Ill

Tectum Fire-Resistant Roof-Deck Material

Tectum is composed of a uniform layer of wood fibers impregnated with an inorganic binder. The roof decks, which weigh two pounds per square foot per inch of thickness, will carry roof loads of 200 lb per sq ft. They can be sawed, routed, mortised, or nailed with standard wood-working tools.

During a recent demonstration, a two-unit structure was subjected to a fire which reached a maximum temperature of 1850 deg and burned for 15 minutes. When flaming materials were removed from the structure, the exposed Tectum surfaces reportedly neither flamed nor smoldered, and the exposed undersides of the Tectum slabs had charred to a depth of only ⅜ of an inch.

Tectum Corp, Newark, Ohio

... INCLUDING

Gear checker for performing composite check of fine-pitch gears having pitch diameters up to 4 in. ..... page 148

Horizontal miller, 40-hp, has underarm redesign permitting heavier cutting operations at greater distance from headstock page 149

Fluoroscope uses gamma rays from radioactive isotopes; only 25% of radiation is absorbed in penetrating ¾-in. steel. page 150

Cutter bodies, with from 3 to 16 blades, incorporate setscrew adjustments for positioning mechanically-held blades ..... page 152

Hydraulic attachment feeds screw machine stock with diameters from 1/16 to 1⅛ in. ..... page 154

Precision surface grinder has 14x24-in. work surface; table speed ranges from 10 to 90 fpm page 156

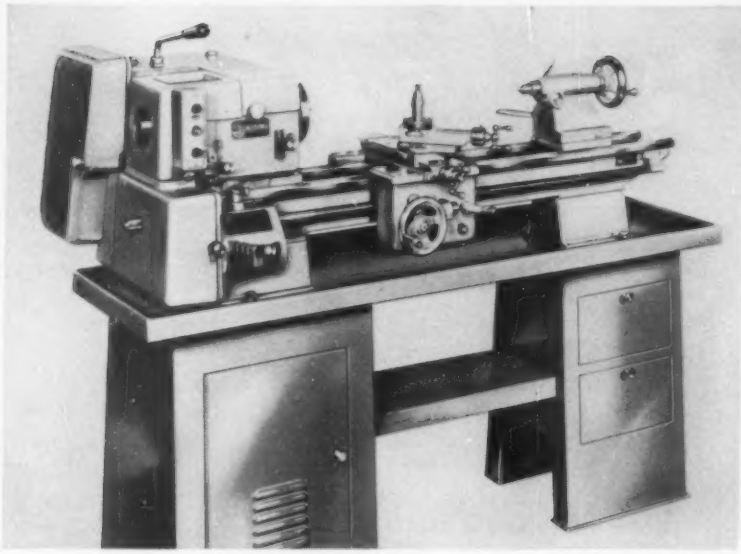
Thread-grinding compound is reported to cut production costs by lowering operating temperature ..... page 158

Stock straightener, specifically designed for narrow material, handles 0.048-in. steel and 0.065-in. brass ..... page 160

... and in Feb 15

Semi-automatic bandsaw designed with increased horsepower and ruggedness to use newly developed HSS saw band.

Hydraulic roll duplicating lathe now incorporates electrical device to select correct operating cylinder.



Clausing 12-In. Lathe Features Twelve Speeds

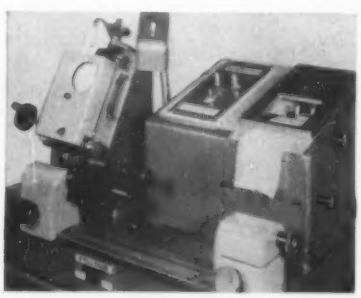
Clausing Model 5300 has a 1-in. collet capacity, a heavy-duty No. 3 MT tailstock with tang socket, 12-in. swing, twelve speeds, 9-in. cross slide travel, and 2¾-in. toolpost travel.

Forged spindle turns on Timken "Zero Precision" tapered roller bearings and is precision ground steel with hardened nose. Both V-ways and flat ways of bed are precision ground; headstock, carriage and tailstock are hand fitted to the bed. The machine is claimed to have massive headstock and tailstock and heavy-duty bed and carriage for great rigidity and resistance to stresses.

Other features include: built-in countershaft with friction clutch and brake, instant selection of 48 threads or feeds, automatic apron with splash lubrication, oil flinger spindle bearing lubrication, steel cable V-belt drive.

Other specifications are, 24, 36 and 48 in. between centers; 12¾-in. swing over bed; 8½ in. over saddle; thread range, 48 — 4 to 224 Standard, right or left. Price: $715, FOB, Iowa.

Clausing Division, Atlas Press Co, 5504 N Pitcher St, Kalamazoo, Mich



Red Liner for Composite Checking Of All Fine-Pitch Gears

This new Red Liner incorporates several refinements for the checking of fine-pitch gears. The instrument provides the type of measurement designated as "composite check," by which all gear errors are measured in combination.

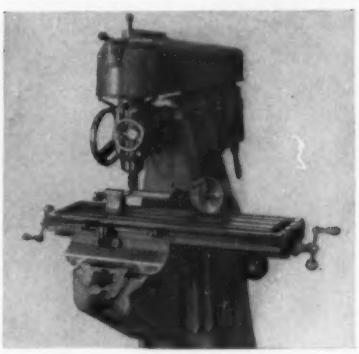
The master gear is mounted on an arbor in a movable spring-loaded carrier and can be rotated either by a handwheel or by motor. It is meshed, without backlash, with the work, which is located in a fixed holder or on fixed centers. As master and work rotate in contact, any variation in center distance is measured and recorded on a constantly moving paper chart. The center distance variations are detected by an electrical sensing device whose output signal is amplified to operate an electrical recorder. By means of an adjustment, the amplification can be set at 200 to 1, 400 to 1, or 800 to 1.

When motor driven, the speed of rotation of the master gear can be varied so that tooth velocity will be maintained at the best operating condition. The charting paper roll is also driven by the motor and the rate of paper travel can be set for 5 or 10 ipr of the master. The pressure between the master gear and work is adjustable to conform with the AGMA standards for measuring fine-pitch gears. The instrument can be furnished as bench-type or with a cabinet. Headstock and tailstock center, and a 0.0001-in. dial indicator for visual inspection without a chart, are furnished as standard equipment. The headstock center is held in a vee and can be replaced by a stationary arbor when desired.

A turret-type fixture, designed for holding several different designs of gears and pinions under ½ in. in diameter, is also available. This fixture is so arranged that a gear or pinion can be loaded in open position and turned under the master gear to a fixed stop which locates it in the proper position.

The instrument will measure gears of 20 pitch and finer up to 4-in. pitch diameter, external or internal.

The Fellows Gear Shaper Co, Springfield, Vt

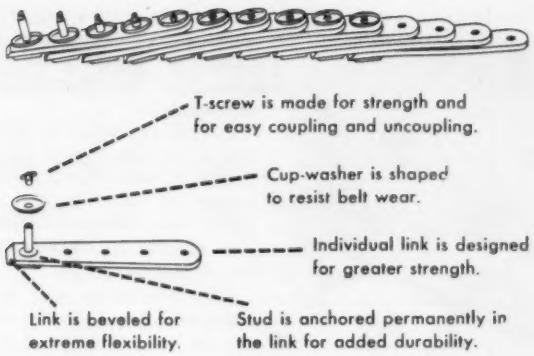


Vertical Milling Machine Designed for Flexibility

U S Burke has introduced a vertical milling machine as companion to the U S No. 1 horizontal miller. Among the features and improvements incorporated are balanced rigidity, simplified belt changing, conveniently mounted switch, and tool storage compartment. The machine is said to offer improved facilities for vertical boring, end milling, dovetailing, and other operations. It was designed to fill the need for a large-capacity vertical milling machine which is extremely flexible.

The vertical table provides a 9½ x 36-in. working surface. Quill travel is 5½ in. The entire head is accurately balanced by mounting the motor behind the supporting column. The guard (hinged on head) and motor can be easily raised to simplify changing of the belt. Weight is approximately 1600 lb.

US Burke Machine Tool Division, Cincinnati Manufacturing Corp, Cincinnati 27, Ohio


T-screw is made for strength and for easy coupling and uncoupling.
Cup-washer is shaped to resist belt wear.
Individual link is designed for greater strength.
Link is beveled for extreme flexibility.
Stud is anchored permanently in the link for added durability.

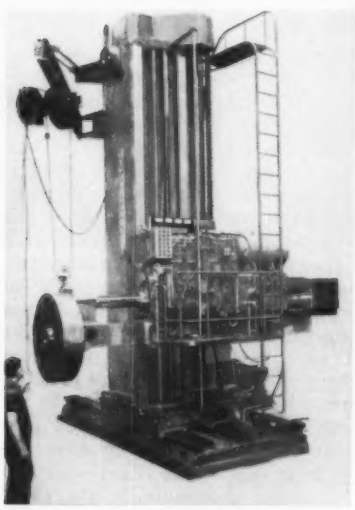
Manheim TD and TE "New Veelos" Adjustable V-Belt

A "new Veelos" adjustable V-belt for D and E drives is now in production. Known as TD and TE, it is said to be a far easier V-belt to couple and uncouple. The new belt, now patented, has been under development for more than five years and field tested in industry since January, 1950.

These link V-belts are made of plies of specially treated high-tensile-strength canvas duck, joined by riveted studs with removable cup-washers and T-screws. This construction gives greater strength and durability at all key points, yet enables the belts to be coupled and uncoupled easily. In addition to the features of greater strength and ease of installation, Veelos belts are said to provide maximum flexibility to last longer, run cooler and smoother.

TD and TE V-belts have broad application in the metalworking industry. Examples include: large machine tools, presses, shears, rolls, air compressors, and fans and blowers. Two types are available: Regular Rubber Coated for general services and Oil-Proof for oily and high-temperature drives.

Manheim Manufacturing & Belting Co, Manheim, Pa



G & L Horizontal Miller Has New Underarm Design

G & L states that improved engineering designs recently adapted to its 570 FUAR underarm add appreciably to the performance of the machine, and also provide greater convenience of operation under all conditions.

Bolted to the bottom of the headstock, the arm is completely encased in a housing which lengthens the bearing surface of the headstock on the column by 14 in. This additional surface contributes to underarm rigidity and load distribution, permitting heavier cutting operations at greater distances from the face of the headstock. The addition of a foot treadle clamp used to secure the underarm in position provides greater operating convenience. The underarm is clamped in position by simply pressing down on the left side of the treadle. By depressing the opposite side the underarm is released. Control of the lever can be obtained from the floor by inserting a hand-rod into the end of the unit.

A time-saving feature designed into the machine is a telescopic sight for reading scale and vernier settings on the machine runway or underarm to 0.001 in. In addition, the feed lever of the underarm is within easy reach of the operator's platform. This lever permits the operator to hand or power feed the underarm or spindle at a 1:1 or 6:1 ratio. Predetermined movement of the underarm's in-or-out travel can be set by means of a dial containing the limit stops.

Basic specifications of the machine are: 7-in. spindle, 141-in. vertical headstock travel, 96-in. horizontal travel of the column, 6-in. underarm travel, 40-hp. headstock motor, plus individual motors for column, headstock, feed and oil pump.

To match the development of the new underarm, the G & L 570 FUAR is now equipped with a two-ton crane for fast lifting and positioning of the underarm attachments. The crane forms an integral part of the machine and is firmly secured to the column. It is capable of covering a wide arc and can be swung behind the machine when not in use.

An example of an underarm attachment served by the crane is the offset attachment with 90° angular milling attachment. The offset arrangement capable of 360° of swivel makes possible the machining of the recessed surfaces which do not allow sufficient clearance for the angular milling attachment.

The use of the continuous feed facing attachment in conjunction with the underarm and spindle support makes possible such operations as turning, facing, threading, backfacing, counterboring, grooving, grinding, and boring of extremely large diameter holes.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis

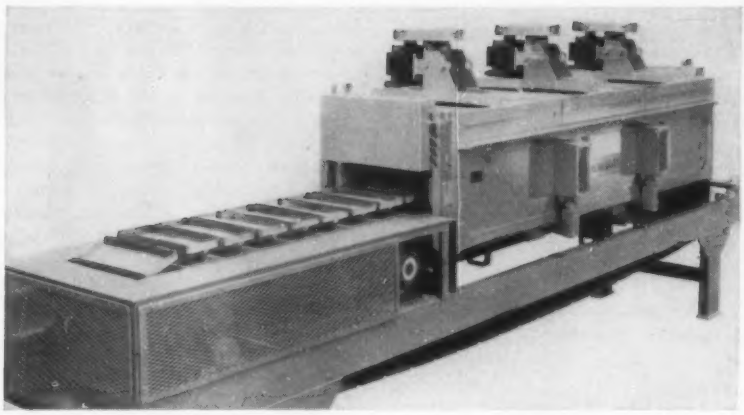
Electro-Hydraulic Servo Valve

High accuracy and speed of response are said to be provided by this series of valves which consists of a group of proportional-type electrically- actuated hydraulic four-way valves featuring no mechanical linkage. These valves are designed to control any maximum desired output flow from 0.5 to 8.0 gpm in hydraulic systems from 1,000 to 3,000 psi. Standard signal input for full output flow is a differential current of ±8.0 milliamperes with lower or higher signal levels also available.

Model 500 valves have a frictionless first-stage push-pull hydraulic amplifier which requires a continuous oil flow of 0.1 gpm. This oil is internally filtered by sintered bronze elements and magnetic traps.

The valve body is constructed of aluminum alloy. Floating type bushing and spool assembly are made of hardened steel. Size is 2 7/16 x 3 1/16 x 1¾ in. deep.

Moog Valve Co, Inc, East Aurora, NY



Heavy-Duty Conveyor Furnace For Continuous Production

This conveyor furnace, ordered by a large manufacturer of jet engine parts, was designed for the heating of aluminum and brass billets prior to forging. However, the manufacturer claims the versatility built into the furnace makes it possible for it to be used to temper, anneal, stress relieve, or do other heating operations requiring a maximum temperature of 1650 F.

Within reach of the operator is a variable speed drive mechanism which adjusts the conveyor speed. By this control, parts to be heated can remain in the furnace chamber from 13 minutes to 2 hours and 10 minutes. By setting the temperature and conveyor speed controls, the operator reportedly achieves exacting results for desired time and temperature cycle.

Furnace elements are of nickel chromium wire wound through ceramic refractories. Three fans speed the heating of materials by circulating the heated air to assure an even and uniform temperature. Conveyor links and trays are made from heat-resistant alloy.

Hevi Duty Electric Co, Milwaukee 1, Wis

Powerful Fluoroscope Uses Gamma Rays

Fluoroscope uses gamma rays from radioactive isotopes rather than X-rays and only 25% of the radiations will be absorbed in penetrating ¾-inch steel. The company says auto manufacturers and foundry men have already expressed interest in the fluoroscope, and suggests that aircraft companies may find it invaluable for use in parts inspection.

The instrument contains a radioactive source consisting of three pellets of cobalt metal one centimeter in diameter and one centimeter long. They were irradiated in an Atomic Energy Commission nuclear reactor. The source radiates 4 watts of gamma rays and has a five-year half-life. That is, in five years, one half the cobalt source will be decayed.

The source, valued at $1,400, reportedly produces these radiations at a cost of ½¢ per watt hour, as compared to the cost of an X-ray tube (exclusive of any power supplied), which runs from $1 to $5 per watt-hour of X-rays produced. Producing one watt-hour of useful X-ray energy also requires 1,000 watt-hours of electrical power.

The gamma-ray fluoroscope stands 7 ft high and weighs 4,500 lb. Its cobalt source is contained in a steel-cased cylindrical lead shield 18 in. in diameter. A 2-in.-thick lead shielding protects the operator from exposure.

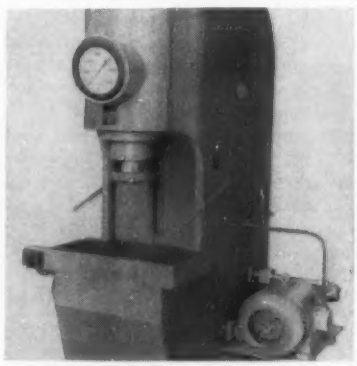
Operation is very simple. The operator, seated before the fluoroscope, peers through a thick lead glass window at a mirror tilted 45°. When the piece to be examined is in place on the work table, the operator merely pulls an exposure lever which retracts a shutter under the cobalt source. A shadograph of the piece being exposed is then visible to the operator.

Small cracks or pores, gas holes, internal flashings in castings or the internal mechanisms in "blind" assemblies can easily be located. The gamma-ray fluoroscope is limited in that the picture is not as finely detailed or contrasted as an X-ray photograph, but neither is it as expensive to operate or maintain. The gamma-ray fluoroscope requires no photographic equipment or dark room, no current, no circulating water, and maintenance is virtually non-existent.

The work table is adjustable so that a piece as large as an automobile engine block can be placed under the source for viewing. The instrument can be modified so that parts can be run across the fluoroscopic screen on an assembly line.

The fluoroscope will be leased to industrial firms. The rental fee has not yet been determined. Radioactive Products will service the instrument and will replace the source when its penetrating power is spent. It will instruct operators and companies in the uses of the fluoroscope.

Radioactive Products, Inc, 443 W Congress, Detroit 26, Mich



Straightening Press Features Two Separate Pumping Units

American Broach & Machine vertical hydraulic straightening press is available with capacities of 75, 100, and 150 tons. The machine features rapid advance, power pressing, and rapid return stroke, and a large dial-type pressure gage and remote control adjustment for relief-valve setting can be supplied.

The hydraulic circuit includes two separate pumping units, both of which are used for the rapid advance and return stroke. One of the units is used to develop the maximum pressure used for the power pressing stroke. A decompression valve in the hydraulic circuit automatically prevents high-pressure shock when the machine ram stroke is reversed.

Cylinder diameters of the three presses are 9, 10, and 12½ in., respectively; ram diameters are 6¼, 7, and 9 in. Operating speeds on the power stroke are 19, 20, and 15 ipm; rapid advance is at 125 ipm; max stroke is 16 in., max open height, 20 in.

American Broach & Machine Co, Ann Arbor, Mich

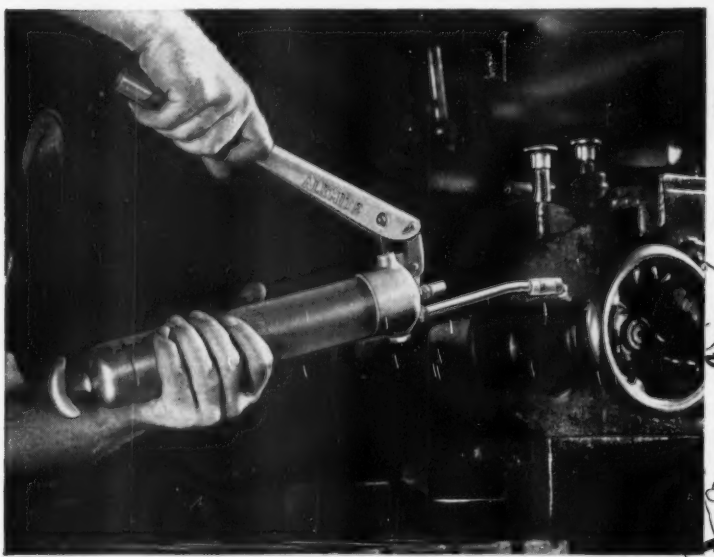
How to cut unit costs..and add to profits!

Time study proves Alemite hand gun loading methods save 3¾ hours per 100 pounds of lubricant used

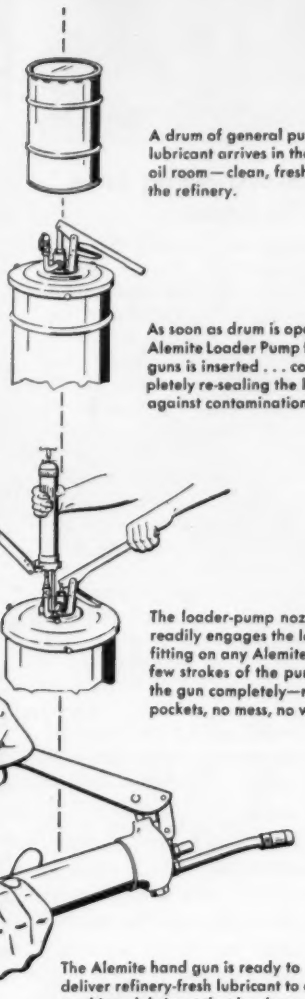
But, the 3¾-hours' saving is only the beginning! You also save on bearing replacements, costly repairs and downtime. Because only clean, fresh lubricant goes from drum to gun to bearing. Your machines can operate at peak efficiency—produce more per hour, more per dollar.

Alemite Hand Guns are equipped with a loader fitting which permits clean, quick mechanical refilling in a fraction of the time required for old-fashioned hand and paddle methods. The loader fitting is placed in the nozzle of an Alemite Loader Pump. Then—just 8 strokes of the pump refill a 1-lb. capacity gun . . . no mess, no waste!

And, there is an Alemite Loader Pump to fit any standard lubricant container you normally use—stationary models for 100-lb. and 400-lb. drums; portable models for 25-lb. or 35-lb. pails. These pumps keep original containers sealed tightly—prevent contamination, help reduce fire hazards.



With Alemite Plan "A" Only Refinery Clean Lubricant Reaches Machines



A drum of general purpose lubricant arrives in the oil room—clean, fresh from the refinery.

As soon as drum is opened, an Alemite Loader Pump for hand guns is inserted . . . completely re-sealing the lubricant against contamination.

The loader-pump nozzle readily engages the loader fitting on any Alemite gun. A few strokes of the pump fill the gun completely—no air pockets, no mess, no waste!

The Alemite hand gun is ready to deliver refinery-fresh lubricant to any machine—lubricant that has been kept free of dirt and abrasives all the way from barrel-to-bearing.

This combination of Alemite Hand Guns and Alemite Loader Pumps is known as Alemite Plan "A." It is one of five Alemite plans that your trained Alemite representative can show you. Ask him to tell you about the colorful, informative new sound-slide film, "No Margin for Error," which will help you and your men cut production costs. No obligation, of course!

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Free! **New Booklet "5 Plans for Better Plant Lubrication"**

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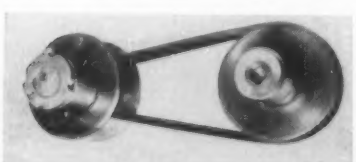
Mechanical-Grip Milling Cutter Cushions Bit Impact

Cutter bodies in diameters from 2½ to 8¼ in., and with 3 to 16 blades, are made with setscrew adjustments for positioning and clamping of mechanically held bits; available in carbide, HSS, and alloy steel, and may be grooved along edges for 10° positive rake. Bits are backed by copper-plated steel squares and grooved blocks that allow bit tilt to prevent damage to bits if cutter jams.

Mechanical bit clamping is claimed to nearly eliminate damage to bits under most difficult conditions; even if spindle is stalled. Square bits can be indexed four times to present new edges; eight times if right- and left-hand cutting is permissible. A 1/32-in., 45° chamfer on each bit edge is standard; this may be 0.005 in. wide if requested.

Cutter bodies are available in standard milling tapers; range in price from $72 to $440. Bit size is 3/16 in. thick by ¾ in. square. Tips are set into body in double negative plane, providing radial and face relief. Cutting speeds allowable are claimed 50% over those with other cutters.

St Clair Tool Corp, 300 1st St, Harrison, NJ



Stepless Speed Variator, Simple, Positive, Flexible

The ICOR Stepless Speed Variator is unique in its compactness and simplicity of operation. As a single pulley unit mounted directly on the motor shaft, this unit provides a driving range of 4 to 1, infinitely variable. Using two ICOR pulleys, one for driving and one as the driven pulley, the range becomes 16 to 1. In the latter case, the distance between centers, driving and driven, remains constant regardless of speed variations. As is frequently the case, the motor utilizing this variator combination need not be shifted on its base every time the speed is changed.

Design of the ICOR pulley includes a control device that keeps both halves of the pulley continuously and exactly centered with the belt centerline. Both the control device and the bearings are entirely free of load or stress, hence maximum life is assured, even under hard running conditions. The V-belt is always automatically stretched; is entirely free of torsional stress. Mounted as an ordinary pulley, ICOR units can be used on any motor or machine. They may be reversed 180°, can drive in either direction, and are used for horizontal as well as for vertical drives.

Speed variation is obtained by simply turning a knob on the side of the regulator pulley. However, positioning is positive. It cannot shift and change speed when accidentally overloaded but will retain a given setting right down to stalling. Elimination of bulky slide rails and pulley housings permits more pleasing, compact, and practical designs at lower cost.

Units are available in 6 sizes, with capacities from ½ to 25 hp.

Imported by Gubelin International Corp, 35 W 53 St, New York 19, NY.

Pallet Load Lifts Have 2,000 Lb Capacity

Market Forge announces production of their Model D (for single-faced or double-faced pallets) and Model SD (for single-faced or double-faced pallets) load lifts with 2,000 lb capacity. The units require less than a 30-lb pull on a level hard concrete floor, less than 25-lb force on the lifting handle to raise the load.

The trucks have an overall width of 22 in., width of forks of 7¼ in., opening, 7½ in. The overall length of the truck, not including the forks, varies from 13 to 24 in., depending on length of forks. Forks are made in lengths from 24 to 72 in.

The front wheels are 8 in. in diameter x 2-in. face and equipped with precision roller bearings.

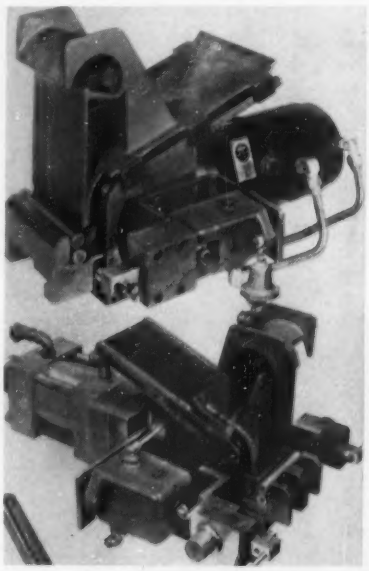
The same hydraulic lifting mechanism which Market Forge used in their skid load lifts and their 3000 and 5000 lb pallet load lifts is incorporated in this unit.

Market Forge Co, Materials Handling Div, 35 Garvey St, Everett 49, Mass

H-P-M Announces Line of Hydraulic Components

Line of hydraulic components includes: fixed and variable displacement pumps, motors; pneumatic and hydraulic cylinders; directional and functional valves, and such accessories as filters, gages, welding flanges, heat exchangers and slip joints.

Hydraulic Power Div, Hydraulic Press Mfg Co, 101 Lincoln Ave, Mount Gilead, Ohio



Red Ring Automatic Loaders For Surface Broaching Machine

National Broach & Machine Co has announced a new line of automatic loaders for single ram vertical surface broaching machines. Loaders are particularly adapted to handling of round parts on which flats, slots, or ends are broached in single-ram machines.

Loaders have magazine feed arrangements that work in conjunction with hydraulic cylinder powered load and unload mechanism. The 1000-psi hydraulic control cylinder is flange-mounted at rear of loaders and operated by an air booster.

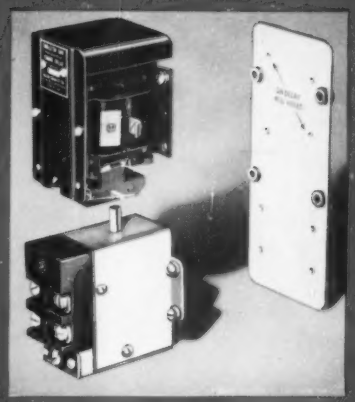
The loader at the bottom of the illustration positions two ⅞-in.-dia, 6-in.-length automotive automatic transmission control rods in front of a broach where two slots and one end are finished by broaching.

Red Ring loaders are made in a variety of sizes to meet specific application requirements. The fixture decribed permits a production rate of 650 rods per hour.

National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich

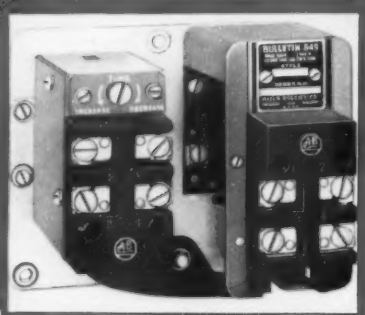
BULLETIN 849 TIMING RELAY CONSISTS OF TWO UNITS

The solenoid operating unit and the pneumatic timing unit are mounted on a steel backplate.



ON-DELAY OR OFF-DELAY

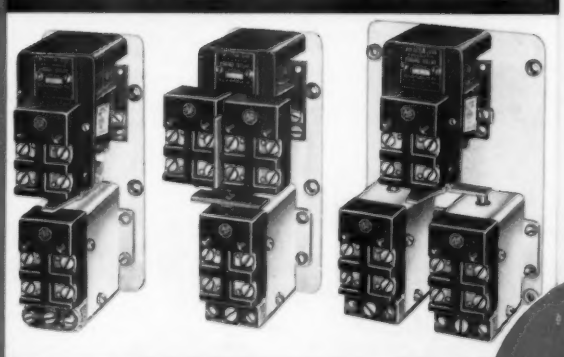
The timer may be arranged for ON-Delay or OFF-Delay. ON-Delay provides time delay when solenoid is energized; OFF-Delay provides time delay when solenoid is de-energized.



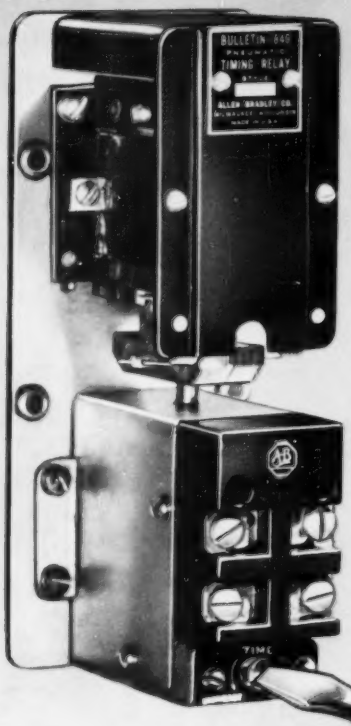
HORIZONTAL CONSTRUCTION

Style ZAX Pneumatic Timer is available for applications in which the horizontal arrangement of solenoid and timing unit satisfies space requirements better than the vertical type.

AVAILABLE IN MANY CONTACT COMBINATIONS

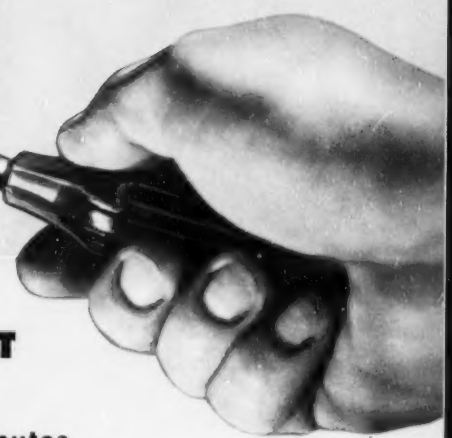


A great variety of contact arrangements can be provided for Bulletin 849 Timers, as shown in the illustrations above. Full details concerning contact arrangements furnished on request.



BULLETIN 849 PNEUMATIC TIMING RELAY

Solenoid Operated



EASY TO ADJUST

for Timing Intervals from 10 Cycles to 3 Minutes

Here is a compact . . . easy to adjust . . . solenoid type pneumatic timer with quick make-and-break silver alloy contacts that operates with an accuracy of ±10% . . . irrespective of temperature, humidity, or vibration. Its wide timing range . . . from 10 cycles to 3 minutes . . . makes it the ideal timer for hundreds of industrial applications.

There are one set of normally open and one set of normally closed contacts. Additional contacts may be mounted on the timer frame and actuated by the same solenoid mechanism. Wiring terminals are all accessible from the front. Send for illustrated Bulletin 849, today.

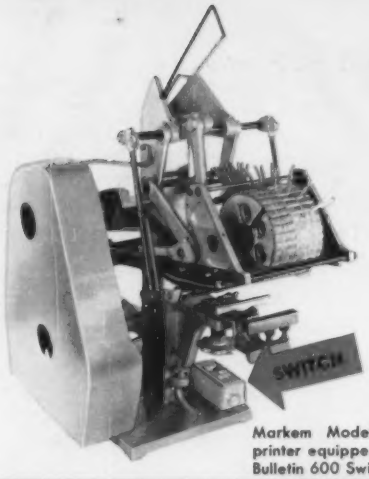
Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

A-B Quality

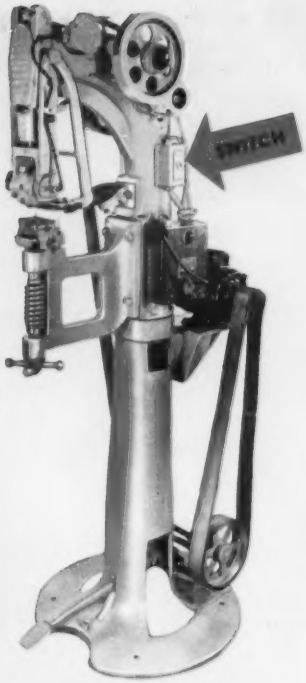
ALLEN-BRADLEY QUALITY TIMING RELAYS

2-54-R

Markem Model 105 heavy duty box and label printer equipped with an A-B Bulletin 600 Manual Starting Switch.



Markem Model 45AC printer equipped with a Bulletin 600 Switch.



Markem No. 2 embosser for indenting and coloring on plastics, wood, leather, etc., with A-B Bulletin 600 Switch.

SNAP SWITCH *with* OVERLOAD BREAKER FOR 1 HP MOTORS AND SMALLER

● Burnouts of small motors can often cause serious production delays. Therefore, dependable overload protection is absolutely essential . . . and for motors of 1 hp or less the Allen-Bradley Bulletin 600 Starting Switch is the logical answer.

It has a built-in thermal overload breaker which trips the toggle switch in case the motor is overloaded . . . and you can't keep the switch closed until the overload on the motor is cleared.

The Bulletin 600 Manual Starting Switch is ideal for small a-c and d-c motors on space heaters, stokers, refrigeration compressors, fans, pumps, packaging machines, labelers, grinders, and other light machinery.

Available in open type construction and also in standard sheet metal enclosures, waterproof and weatherproof enclosures, and gastight enclosures for installations in hazardous gas locations.

Bulletin 600 Manual Starting Switches can be furnished in various auxiliary combinations—namely, with pilot lights, selector switches, and key and lever switches, as illustrated below. They will fit into standard conduit switch boxes if desired. The double break, silver alloy contacts need no attention. Bulletin 600 gives dimensions and other data.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

A few examples of the variety of enclosure combinations in the Bulletin 600 Manual Starting Switch line.

A-B Quality

ALLEN-BRADLEY

BULLETIN 600 STARTING SWITCHES

QUALITY

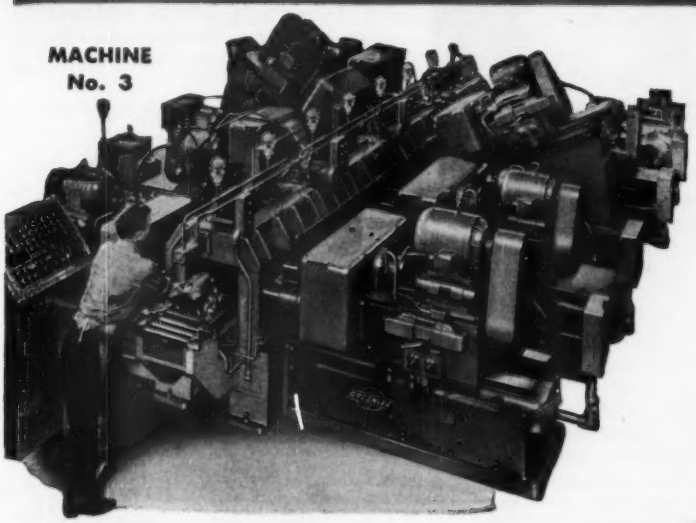
2-54-MR

208 OPERATIONS IN 44.3 SECONDS

These recently-built Greenlee transfer machines mill, bore, drill, ream, and tap transmission cases for a well-known automobile. A total of 183 tools complete 208 operations in an automatic cycle time of 44.3 seconds. Features include face and end-milling heads, turnover and chip-cleanout stations, and indicator lights for tool changing. Self-contained hydraulic units conform to JIC standards for easy maintenance. These outstanding machines are among the newest built by Greenlee — a pioneer in progressive transfer-machine principles.

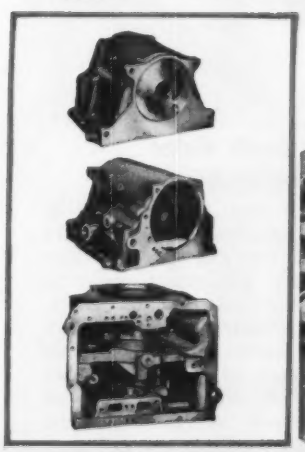
MACHINE No. 4

GREENLEE



MACHINE No. 3

TRANSFER MACHINES
PROCESS
AUTOMATIC
TRANSMISSION CASES
AT THE PRODUCTION RATE OF
65 CASES PER HOUR



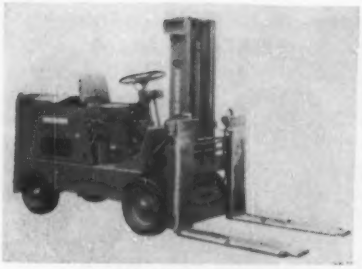
MACHINE No. 2

MACHINE No. 1

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1722 MASON AVENUE
ROCKFORD, ILLINOIS

MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



Towmotor Roll-Off Device Stacks Loads Lengthwise

Towmotor has introduced its roll-off accessory to aid in storing lengthy loads lengthwise.

Device stores unit loads of bar steel and pipe in stacks, without manual handling. It consists of two hollow forks with a roller attached to the outside edges; units fit sheath-like over standard Towmotor forks. Device is connected to main hydraulic system with quick detachable couplers, and is operated by a valve in the cab. Serrated edges at the tip of each fork unit provide a sure grip when pushing or pulling loads lengthwise. Unit is a special development, not a standard item.

Towmotor Corp, 1226 E 152nd St, Cleveland 10, Ohio

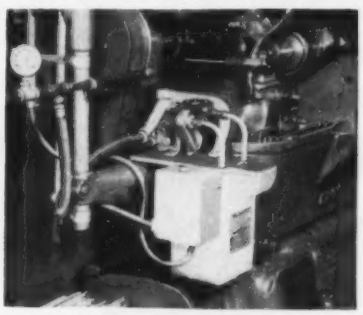
Black & Webster Redesigns Electropunch Impact Tool

Redesigned Electropunch, known as Series 4, incorporates improvements in adjustment, operation, and maintenance. Same basic dimensions as previous series are retained, as well as delivery of variable impacts up to 3500 lb at rates of more than 125 blows per minute.

Changes have been made in the base to provide more working surface, and a skirt added to protect recessed hand switch from breakage or accidental operation. Adjustable bracket has been strengthened to give the solenoid better support and alignment. Bracket also houses plunger and return spring for safety and elimination of dust. Entire solenoid is enclosed in a perforated steel housing; cover can be easily removed for disassembly. Adjustable, cushioned return stop has been added on top of solenoid to limit return stroke.

The 50-lb bench model unit, operable by hand, foot, or automatic switch, is said to be particularly adaptable to operations requiring speed and high production rates.

Black & Webster, Inc, 445 Watertown St, Newton 58, Mass



Hydraulic Feed Attachment Speeds Screw Machine Output

Hydra-Lite attachment for feeding screw machine stock has been introduced to speed handling and reduce many subsequent operations. Hydraulic operation eliminates feed fingers, which often score bars; thus ground and polished stock can be fed without resultant scratches.

Signal light turns on automatically as bar end approaches, enabling operator to be ready with a new bar. Self-contained, independent unit is equipped with its own hydraulic pump and supply of oil for feed.

Models are available for all No. 00,0, and 2 Brown & Sharpe machines and feed stock from 1/16 of an in. to 1⅛ in. in dia. Average job requires only 20-lb oil pressure which will feed piece lengths up to 3 in.; pressure can easily be adjusted to feed up to 5-in. piece lengths. Under heavier pressures necessary to feed large bars, a metering valve is provided on the No. 2 feed to automatically control fpm of bar travel, eliminating excessive shock and possible damage on turret parts. Constant pressures are maintained on all feed sizes.

Attachment, which is side-mounted on the machine, requires standard 110-v, 60-c outlet connection.

Aurora Precision Devices, Inc, 318 Anderson Blvd, Geneva, Ill

SiClone Wheels for Carbide Tool Grinding

SiClone series of silicon carbide wheels for grinding tungsten carbide tools reportedly cut faster and much cooler than wheels previously available. Field tests indicate substantially longer life in use.

According to the manufacturers, new ingredients in the vitrified bond, combined with a distribution of the abrasive particles calculated to enable them to penetrate and cut tungsten carbide with maximum efficiency, account for the wheel's performance.

Fuller Merriam Co, 70 Water St, West Haven, Conn

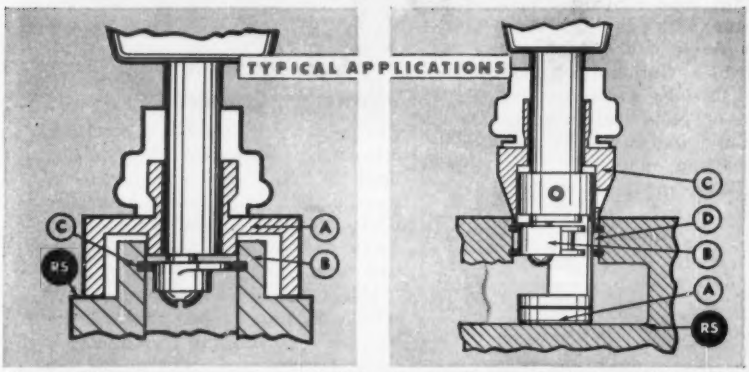
Industrial Bench Makes Special Shop Equipment

Industrial Bench & Equipment is manufacturing special all - steel stands. Button and fastener machine stand illustrated can be equipped with ball bearing casters, if desired. All curves and angles are made to blueprint specification. Unit is made of formed ⅛-in. sheet steel, completely welded; top and bottom are reinforced by steel gussets; stand is fittted with two drawers.

Industrial Bench & Equipment Mfg Co, 98 South St, New Britain, Conn

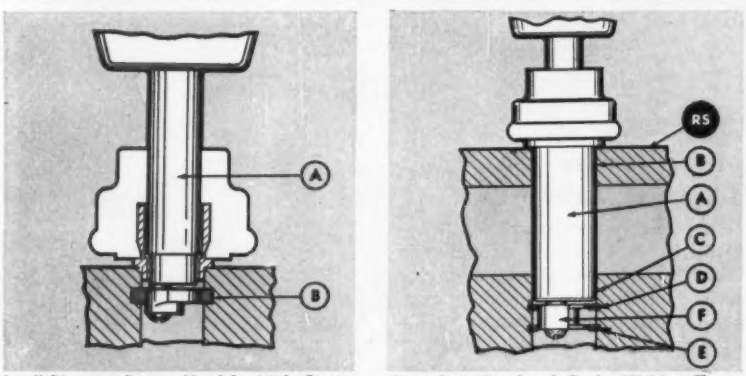
Waldes Truarc Grooving Tool Out-Performs Conventional Recessing Tools

SAVES TIME! CUTS COSTS! NEEDS NO SKILLED LABOR!



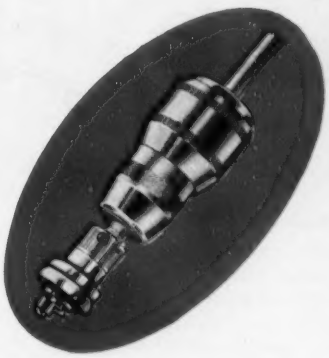
Clearing Obstructions or Protrusions — Waldes Truarc Grooving Tool with *special bushing* with high shoulder A in order to clear obstruction B on reference surface RS so groove can be properly located in bore.

Locating Grooves from Bottom of Hole or Blind Hole—Use of *bottom adaptor* A and double cutter B. Bushing C pilots tool into bore D while bottom adaptor acts as stop to locate grooves from reference surfaces RS below bore.



Small Diameter Bore — Need for Wide Groove — Great versatility of tools allows A-2 Tool to accept *stepped down spindle* and *cutter-shaft* assembly A. Provides cutting capacity in a bore normally within the range of smaller A-1 Tool. Illustrated, larger tool capacity necessary to cut groove diameter B exceeding normal capacity of standard A-1 Tool.

Extending Reach of Tool — Waldes Truarc Grooving Tool assembled with *extended bushing* A increases normal range of tool in order to reach proper groove location in bore. Bushing also registers on reference surface RS of workpiece while piloting tool at two points B and C inside bore. Two grooves D and E are cut simultaneously with double cutter F.



AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in housings with diameters from .250 to 5.000 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEM TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.

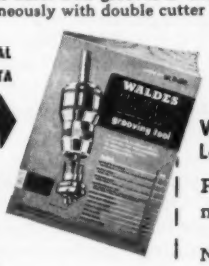
WRITE NOW FOR 20 PAGE TECHNICAL MANUAL CONTAINING FULL ENGINEERING DATA

WALDES

TRUARC

Reg. U. S. Pat. Off.

GROOVING TOOL



MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS.

WALDES KOHINOOR, INC., 47-16 Austel Pl., L.I.C.1, N.Y. Waldes Truarc Grooving Tool mfd. under U.S. Pat. 2,411,426

AM 026

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, New York

Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool.

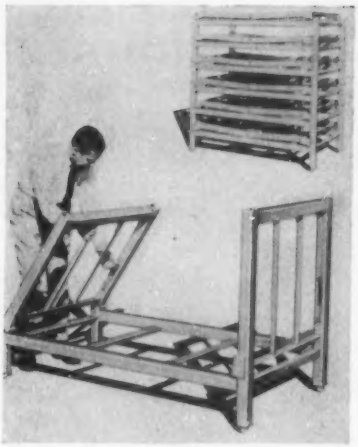
Name_____

Title_____

Company_____

Business Address_____

City_____ Zone____ State_____

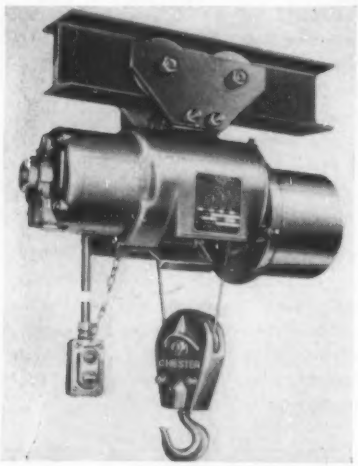


Collapsible Stacking Rack

Portable, self-stacking rack for miscellaneous materials is designed so that ends fold inside the frame when empty, or in shipping. Ends lock in vertical position when swung up.

Units, available in a wide range of sizes, can carry loads of 3000 to 5000 lb, and can be stacked to six tiers high, loaded to full limit. Floors can be furnished in plywood, boards, or sheet steel.

American Metal Products Co, 5959 Linsdale Ave, Detroit 4, Mich



Chester Electric Hoists Have Unique Load Braking System

Line of eight Chester electric hoists, ¼ to 2 ton, has been introduced.

Basic design features are high-torque electric motors with 30-minute 55 C time rating; triple reduction gearing under continual lubrication; dual braking, on load and motor, for precise spotting control and maximum safety. Load braking system employs a non-reversing automatic spring clutch to actuate the oversize Weston brake without pawls or ratchets. Either motor or load brake can hold the rated load indefinitely suspended, even when power failures occur.

Five of the models have flexible wire-rope cable lift and pendant pushbutton control; available in ¼- to 2-ton sizes at 15 to 38 fpm lifting speeds. Three are equipped with welded alloy steel link chain lift and pendant rope control; capacities ¼ to 1 ton; lifts adaptable up to 66 ft. Both single and polyphase models available. Optional suspension offered includes stationary lug, single hook, or plain trolley adaptable to all monorails as well as standard I-beams and mounting hoist either parallel to or across track.

Chester Hoist Div, National Screw & Mfg Co, Lisbon, Ohio

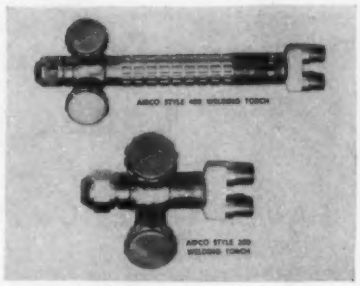
Deep-Throat Bandsaw Takes Wide Range of Varied Work

Bett-Marr three-wheel bandsaw with 24-in. throat is especially designed for cutting stacked sheet metal. Versatile speed control makes it readily adaptable for cutting iron, steel, forgings, aluminum, bronze, brass, copper, stainless.

The 61-in.-high saw permits center cutting on sheets up to 48 in. Blade is guaranteed to stay in position on the wheel, assuring perfect control for smooth cutting. Speeds can be quickly adjusted: from 100 fmp (for iron, steel, and forgings); to 600 fmp (for stacked aluminum and galvanized sheets, bronze, brass or copper); to 330 fpm (for wood, plastics, and stainless steel.) Smooth friction cutting of stainless up to 8-gage is possible at 3300 fpm.

Rugged, all-cast frame is designed to eliminate blade chatter and assure smooth cutting performance and stability at all speeds. Positive two-wheel chain drive eliminates blade slippage for better cutting results. Saw is delivered complete with sheet-metal clamps and riser bar insert to match.

Bett-Marr Manufacturing Co, Hopkins, Minn

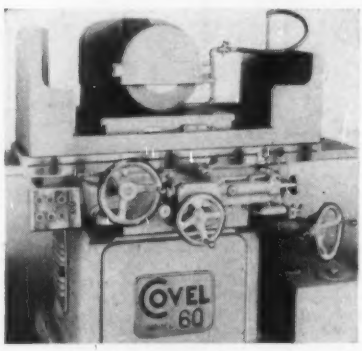


New Airco Torches Are Lightweight, Compact

Two new Airco torches have been introduced. Model 400, designed for light welding and brazing operations, is 5¾ in. long, weighs 6 oz. Cutting attachment is available for quick adaptation to occasional cutting jobs.

Model 300 is a compact, lightweight torch developed primarily for oxyacetylene burning or welding of lead products and light production work. The 5-oz unit is 2½ in. long. Both models have ball-type oxygen and acetylene valves, positioned for easy thumb adjustment; variety of tips, mixers, and extensions is available.

Air Reduction Sales Co, 60 E 42nd St, New York 17, NY



Covel Surface Grinder Has 15-in. Crossfeed

Model No. 60 precision surface grinder has a work surface of 14x24 in., a crossfeed width of 15 in., table travel of 27 in., and vertical work capacity of more than 18 in. It is said to be highly adapted to grinding of trim and mold dies, plastic molding and forming dies, and form and cutoff tools.

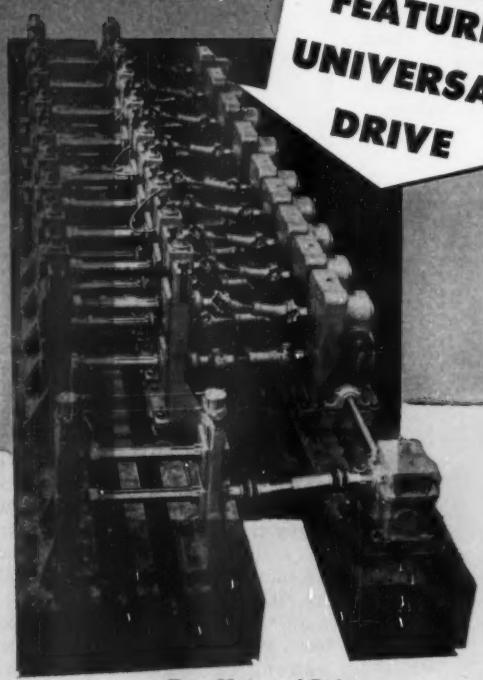
Table speed ranges from 10 to 90 fpm. Other features are: elevating handwheel located below table level, built-in truing device, closed hydraulic circuit, powered elevation, and automatic lubrication.

Covel Mfg Co, Benton Harbor, Mich

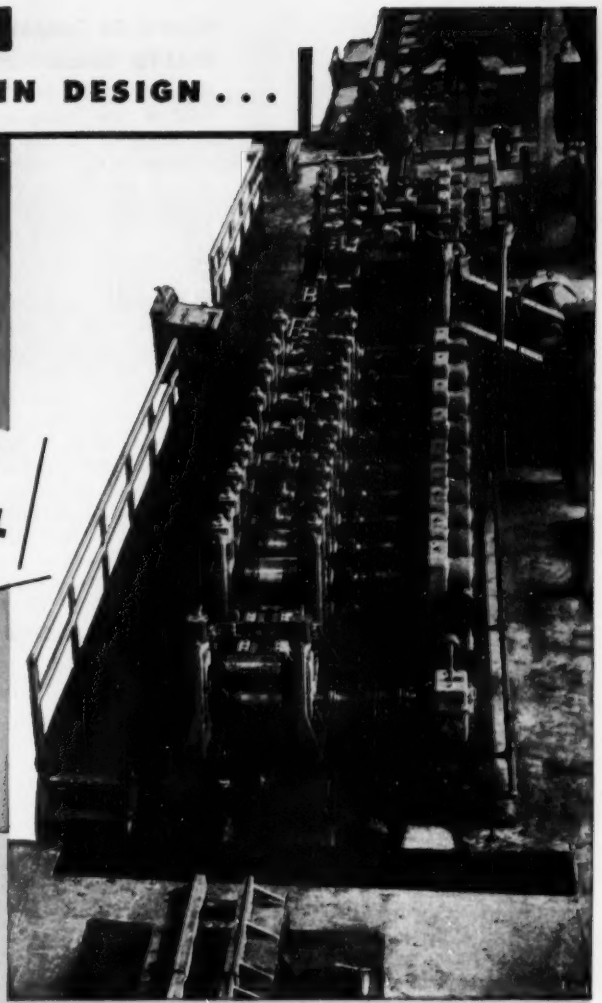
LEADING THE INDUSTRY IN DESIGN . . .

Etna TUBE MILLS

FEATURE UNIVERSAL DRIVE



Etna Universal Drive



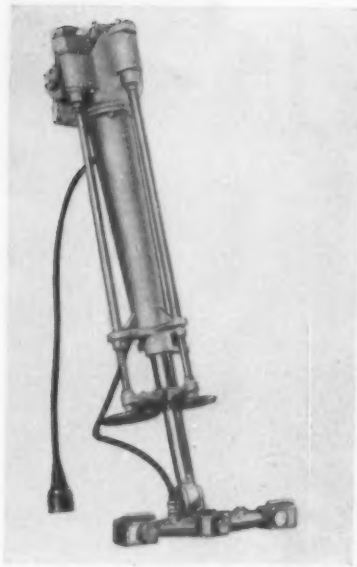
You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

PERMANENT OIL COOLED TRANSFORMER

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced.* Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

Abbey ETNA Company

3404 MAPLEWOOD AVE., TOLEDO 10, OHIO



Danly Press Control Has Adjustable Unit

Control unit offers a flexible method for positioning the run and stop buttons of a press. Buttons are mounted on a sturdy control bar suspended from the press by a universally adjustable telescoping arm. The height and position of the buttons are quickly adjustable. With each change of dies, control bar can be relocated to save motion and time. When changing dies, the arm can be swung completely clear of the working area.

Major movements of the adjustment arm, front to back and right to left wing, are made with worm gearing, turned from handwheels near the buttons. Adjustable stop prevents overtravel in direction of slide.

The control bar is mounted on a set of two swivels which allow universal movement and lock positively by means of serrations. The bar is a single sturdy casting recessed for three button assemblies; it is equipped with two run buttons at the end positions and may be had with or without a stop button at the center position.

Danly Machine Specialties, Inc, 21000 S Laramie Ave, Chicago 50, Ill

No. 1 dust hood has been designed to protect eyes, head, face, and neck from nuisance or irritating dust. The 5-oz protector is made of lightweight cloth, with a large picture window offering full unrestricted vision in all directions.

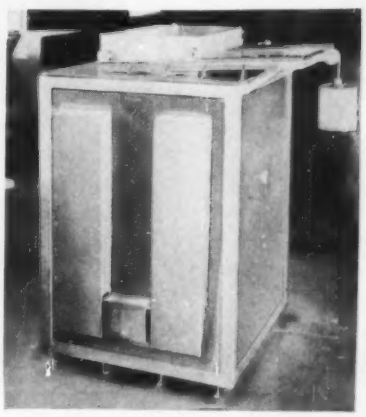
General Scientific Equipment Co, 2700 W Huntington St, Philadelphia 32, Pa

Vantrol Oil Compound Used for Thread Grinding

Vantrol 5299M, developed two years ago, is now being used in thread-grinding operations. The compound has reportedly brought sharp reduction in production costs by a cut in operating temperature which has eliminated burning of threads, given more pieces per tool grind, and less wear on diamonds used for dressing the wheels. Adequate lubrication is also provided by the chemical characteristics of the Vantrol.

Reports of one case study performed on single-wheel thread-grinding operation on steel alloys hardened to 28-32 Rockwell C indicate that part production per wheel dress was increased from two to three, and oil carry-off was reduced from five to three gallons per day.

Van Straaten Chemical Co, 546 W Washington Blvd, Chicago, Ill



Top Loading Electric Furnace

Model PT-2550 Pereco electric pit furnace provides close control to 2500 F.

Lid over the firing chamber is ball-bearing mounted, side-sliding and counterbalanced for easy action, to permit loading from a hoist or conveyor. Fully insulated with 9-in. superduty, graded lightweight insulation of high thermal characteristics, unit may be equipped with any standard temperature control required. Facilities for panel mounting are provided. Voltage regulating 36-tap magnetic contactor power controls are supplied; model is available with or without atmospheric controls for oxidation conditions.

Firing chamber of 18,900 cu in. measures 18 in. wide x 25 in. deep x 42 in. high. Over-all dimensions: width 48 in., depth 53 in., height 82 in.

Pereny Equipment Co, 893 Chambers Rd, Columbus, Ohio

Flat Lapping Machine Produces Fine Finish

Spitfire precision flat lapping machine is said to produce fine micro-inch finishes with great speed and at low cost. The machine is said to be ideal for sliding or rotating parts, air-tight seals and valves, measuring device, plastic and die casting molds, and other sealing surfaces. Lapping can be done on metals, glass, quartz, plastic, and other material.

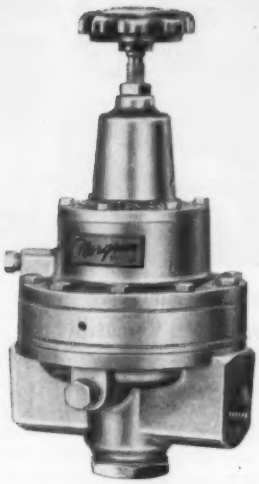
The unit incorporates a revolving lapping plate 24 in. in dia, 2 in. thick; heavy cast-iron housing; a ½-hp motor; and a heavy steel base. All parts are enclosed. No chucks, collets, holders, or tools are needed.

As many as four operators may work at the machine at one time and, with small pieces, each operator may lap two pieces at once. Use of the machine requires holding and manipulating the work on the revolving abrasive-covered lapping plate exercising just enough pressure to maintain the working position.

Spitfire Tools Co, 2931-35 North Pulaski Rd, Chicago 41, Ill

Type A-308-78M roller-top, caster-steer trailer is a 3000-lb capacity unit with two roller conveyor sections at a height of 30 in. from floor. It has been designed to fit into standard conveyor lines to permit pickup and transfer of packaged units. Live deck is made of two 6-roller sections; rollers have a 1.9-in. dia and are 30 in. long; platform size is 49x72 in. Use eliminates need for fork trucks at discharge point of conveyor and pallet-loader lines.

Mercury Mfg Co, Chicago, Illinois

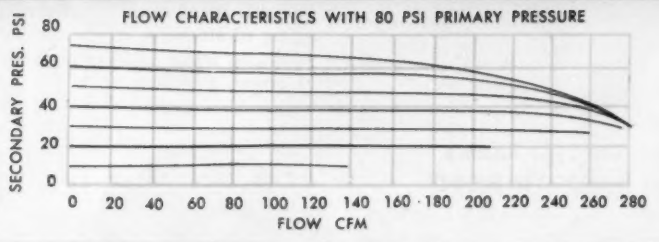


Norgren Pilot-Controlled Regulator, Integral Type; also available with remote control.

performance data prove NEW Norgren Pilot-Controlled Regulators

• have greater capacity

• are more accurate



Using accurately controlled air pressures is essential not only for proper operation of any air equipment, but also to assure minimum maintenance and long life. Norgren Pilot-Controlled Regulators provide extremely accurate, automatic pressure regulation, with capacities up to 200 cfm. In addition to substantial savings through better equipment performance Norgren Regulators more than pay for themselves in savings in air costs alone.

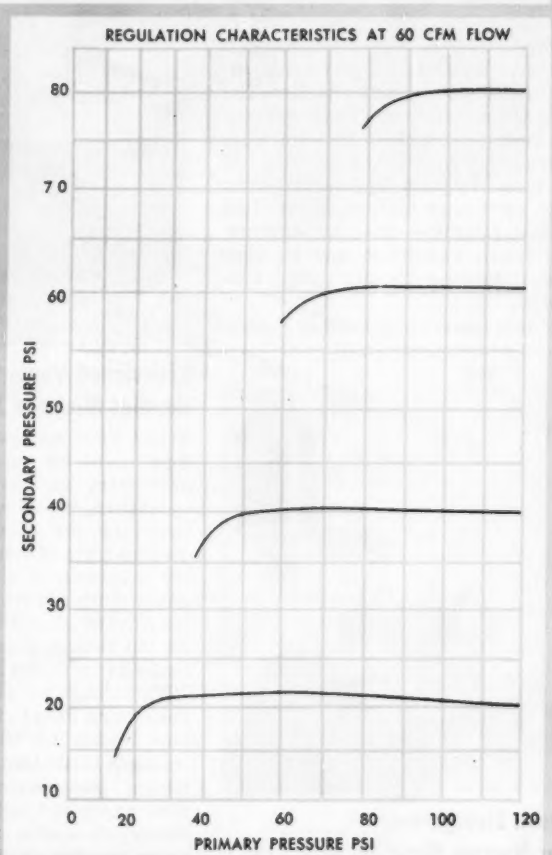
Available for lines carrying air, cold water, oil and non-corrosive gases and liquids.

Precision air regulator for flows up to 2 cfm.

Relieving type air pressure regulator for ⅛" to 1" air lines.

Cylinder gas pressure regulator. Reduces tank pressures up to 3000 psi to working pressures below 450 psi.

Low pressure regulator reduces line pressures to working pressures up to 60 psi.



WRITE FOR NEW CATALOG No. 600

PIONEER AND LEADER IN OIL FOG LUBRICATION FOR 26 YEARS

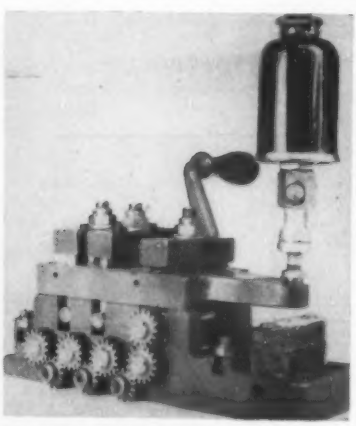
Valves • Filters • Regulators • Lubricators • Hose Assemblies

C. A. Norgren CO.
3436 So. Elati, Englewood, Colo.

Huppert Box-Type Furnace Ranges from 300 to 2000 F

Temperature range of this new high-temperature electric box-type heat-treating furnace is from 300 to 2000 F. Temperature is controlled through Huppert Infitrol and electronic indicating temperature controller. The K-R series is built in five sizes, ranging from 6 in. wide, 6 in. high, 9 in. deep to 10 in. wide, 8 in. high, 18 in. deep. Furnace is designed with new skirt-type cabinet and is furnished complete with transformer, contactors, switchbox, and an electric-indicating temperature controller.

K H Huppert Co, 6830 South Cottage Grove Ave, Chicago 37, Ill



Stock Straightener For Narrow Material

The Mighty Midget is said to be the only low-cost stock straightener specifically designed for narrow material (up to 2 in. wide). The unit has a capacity of 0.048 in. in steel, and 0.065 in. in brass and aluminum.

Features include: built-in stock oiler with replaceable felts; seven hardened and ground rollers, five for straightening and two for feeding; gear-driven lower straightening rollers and feed rollers; gears protected by cover; front and rear ball bearing guides; all bearings either ball, needle, or oil-impregnated bronze; pressure rollers with adjustable stops so that new roll of material is fed through in minimum time; hand crank which can be removed; four 5/16-in. holes for mounting; and hardened and ground pressure roller shafts. Can be supplied as an electric-motor-driven unit with a variable speed drive to synchronize feeding of stock.

Sperman Metal Specialties, 2199 E 21st Street, Brooklyn 29, N Y

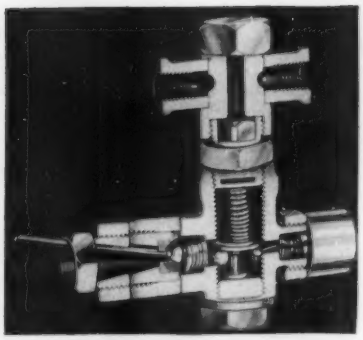
Redesigned Vapor Collector Handles Mist and Sludge

Model VCM-2 vapor collector is the type normally used for collecting mist from various wet machining operations, including grinding. However, the use of an abrasive belt created a set of conditions requiring the collection of more than mist. A heavy sludge is created by the combination of oil and abrasive knocked off the belting, plus lint and stringy material from the belting itself.

This sludge not only loaded up the connecting lines to the collectors, but also loaded up the blades of the multiple blade fans as well. The new design incorporates paddle wheel fans which not only resist the tendency of sludge material to load them up, but also provide an increase in the total cfm capacity.

The motor rating is still ¾ hp, but there has been an increase in overall height of 5½ in. Baffles in front of each outlet connection intercept direct throw of sludge.

Aget-Detroit Co, Ann Arbor, Mich



Wobble-Rod Air Valve Features High Versatility

The unique operating principle, all-metal construction, and flexibility of both mounting and application of the Pantex Wobble-Rod valve, are said to offer new possibilities to designers and users of pneumatically-operated equipment.

The lever which opens and closes the valve is a hardened rod, so swiveled that the free end can move vertically, laterally, diagonally or in arcs and circles. It allows lateral play during a vertical throw, permits direct linkage to rotating, oscillating, toggle, lever, slot, or straight-thrust mechanisms. It is easily spring-loaded to remain normally open rather than normally closed.

Incorporated is an internal exhaust valve which will automatically discharge an air cylinder, line or receiver when the valve closes, but can be eliminated where it is desirable to hold airline pressures after the valve has done its job. Another integral feature is a check valve (ahead of the ball-and-seat) to prevent backsurge.

Body casting is designed to permit two valves to be assembled into one unit. Three-way, four-way, tandem, or synchronized operations can be served.

Construction is of bronze, brass, and stainless steel throughout; there are no rubber or fiber seats or diaphragms. Dissimilar metals are used at all friction points to prevent galling. All springs are of compression type.

Versatility of installation is the result of both right- and left-hand outlets (¼-in. ips); a double-ended inlet (¼-in. ips) which can be rotated and clamped through a full 360°, and a drilled and tapped flange for panel or bracket mounting. The valve will operate in any position.

Pressure range is up to 125 psi; overall dimensions are 3⅛ x 5 x 4⅝ in. Weight is 2¼ lb; price, $23.50.

Pantex Mfg Co, 521 Roosevelt Ave, Pawtucket, RI

The A. O. Smith *Champion* Heavy-Duty A. C. Welder

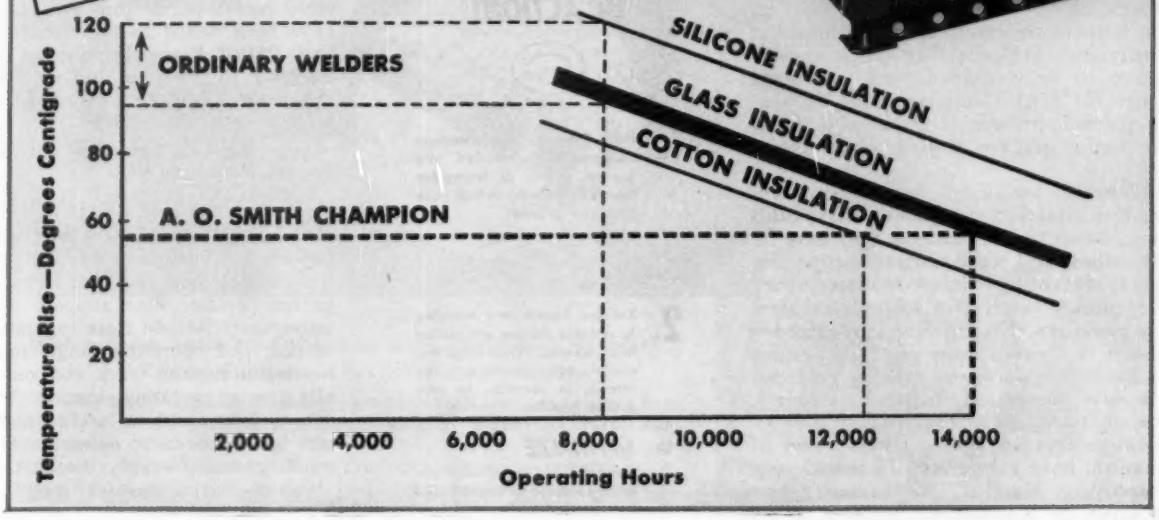
6000 hours longer life

than any other A. C. welder

Available in 300-, 400-, and 500-Amp. models.

PROOF

LIFE EXPECTANCY CHART



Temperature Rise Determines Machine Life

According to the Insulation and Aging versus Temperature Curves, as published by the A.I.E.E. . . . *the cooler a welding machine operates, the longer its production life.*

The A. O. Smith Champion is the *only* A. C. welder on the market with enough copper and cooling capacity to operate without exceeding a 55° C. temperature rise—as compared to the 90° C. rise allowed by N.E.M.A. for glass-insulated welders.

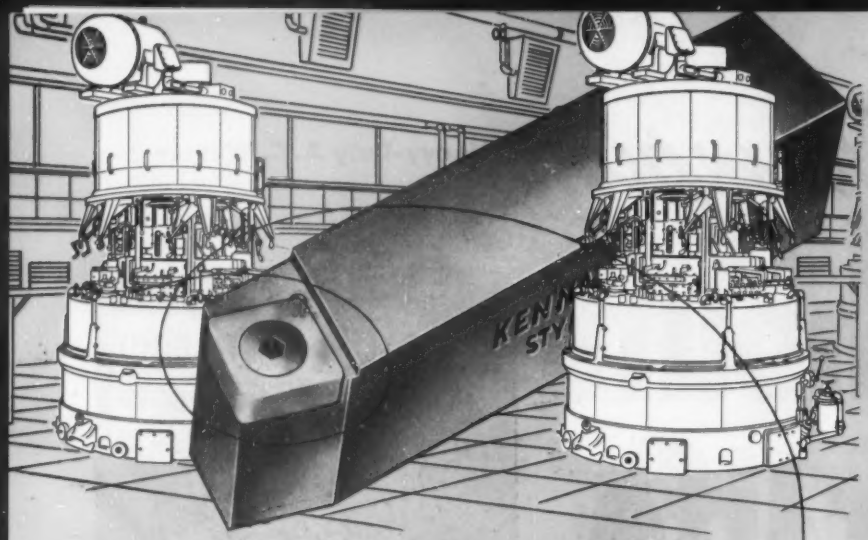
This means: The Champion will give you top production efficiency almost twice as long as any other A. C. welder on the market today.

Built for those who want the best in welding, the Champion has a full 75 open circuit volts, high-velocity down-draft ventilation, all-weather case, 12½ KVA power factor correction and stepless current control.

For additional information on welding machines, electrodes and accessories, see your local A. O. Smith distributor or write to A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION
Dept. AM-254, Milwaukee 1, Wisconsin
INTERNATIONAL DIVISION: MILWAUKEE 1
Made by welders . . . for welders



The Most Critical Point in AUTOMATION

Machine shop automation—the new trend toward automatic conveying, loading, cutting, unloading, and transferring of workpieces—promises great gains in productivity, but it must have cutting tools designed for the operation.

Two features are essential in cutting tools for automation: (1)Durability which enables operation to be sustained with minimum stoppage for tool changing, and, (2)precision-ground, pre-set, multiple-edge tools which permit quick changing when necessary.

Kendex "throw-away" inserts —an exclusive Kennametal development—have both features. Made of Kennametal, they have its high hardness and wear-resistant properties for great durability. Screw-mounted, they can be quickly rotated, in seconds, to new cutting positions. No grinding is required—the insert is thrown away after all cutting edges have been used and quickly replaced with a new preground "button" ... round, square, or triangular as required.

Our engineers, in on the ground floor of automation, have cooperated in developing and applying Kendex, Kennamatic,* and other types of Kennametal tooling to its requirements. The features of this tooling may be the solution to reducing machining and tool maintenance costs—on any operation—in your shop. Ask your Kennametal tool engineer how you may apply it to advantage. Kennametal Inc., Latrobe, Pa.

KENDEX* tooling keeps AUTOMATION *IN ACTION!*

1. Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.

2. Kendex inserts are mounted to suitable holder with socket head screws. When edge becomes dull, insert can be turned, in seconds, to new cutting position.

- *MINIMIZE* downtime for tool changing—a major cause of unprofitable operation.
- *ELIMINATE* tool grinding expense—Kendex inserts are not ground; simply thrown away when all cutting edges have been used.

*Registered Trade-Marks

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

SALES OFFICES IN PRINCIPAL CITIES

A-5

Two non-shrink laminating resins, Toolplastik L-900 and Toolplastik Gelkote L-910, have been introduced for plastic tooling applications. Both are non-corrosive, non-brittle, easy to handle, apply, and cure at room temperature. Special equipment is not required. L-900 is for standard laminating applications; L-910 produces a high-gloss surface on laminating tools. Both can be used in the same tool to produce excellent surface finishes that do not require polishing or machining.

Rezolin, Inc, 5736 W 96th St, Los Angeles 45, Calif

Brush for cleaning leader-pin holes in die sets is equipped with bristles resistant to acids and alkalies common to oil, naphtha, detergents and industrial cleaning fluids. Brushes are available in bristle dia of ⅞ to 2¾ in. and measure approximately 10½ in. Packed one dozen per box, priced at $3 per dozen for ⅞ to 1¾ in. bristle dia and at $4.80 per dozen for 2 to 2¾ in. bristle dia.

Biltwell Brush & Mfg Co, 225 S Church St, Rockford, Ill.

Steel stamps for marking fractions on nameplates, components, and other metal parts and assemblies have been added to the Ramshead line. Called Fracme's, stamps are available in fractions ranging from 1/32 to 31/32 in three overall sizes: ⅛, 3/16, and ¼ in.

Acme Marking Equipment Co, 8030 Lyndon, Detroit 38, Mich

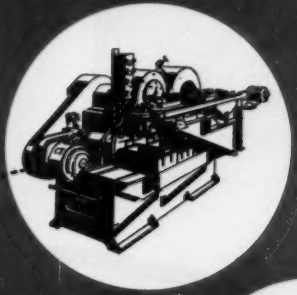
Model Y high-speed steel hardening furnace has been redesigned. Heavy welded plate base has been added to provide greater floor support. Improvements include close regulation of heat and operating range, rapid heating to desired temp, and generally greater operating economy. Silicon carbide resistors located above and below one-piece silicon carbide muffle chamber supply the heat.

The Sentry Co, Foxboro, Mass

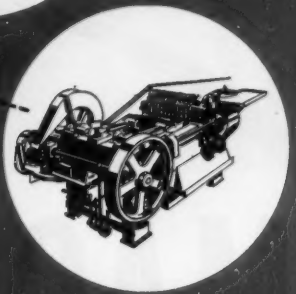
High-density material has been developed which is practically pure tungsten with small amounts of nickel and copper added to aid machinability. It has a specific gravity of 17.5-18.2 which makes it up to 60% heavier than lead. Firth heavy metal has a tensile strength of good quality steel. Can be supplied up to 20-in. dia by 18 in. high, or an equivalent volume up to 3500 lb.

Firth Sterling, Inc, 3113 Forbes St, Pittsburgh 30, Pa

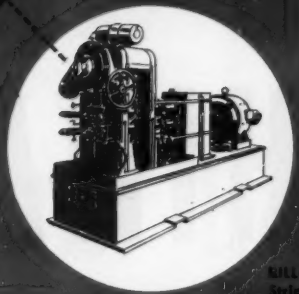
5 KINDS OF WATERBURY FARREL ANSWERS TO YOUR MASS PRODUCTION PROBLEMS



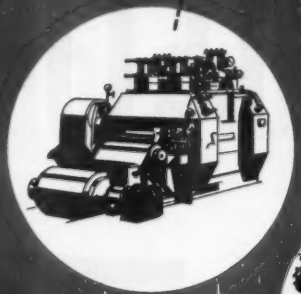
COLD PROCESS BOLT & NUT MACHINERY — Headers (all types) • Rivet Machinery • Trimmers • Thread Rolling Machines • Slotters • Nut Formers and Tappers, etc.



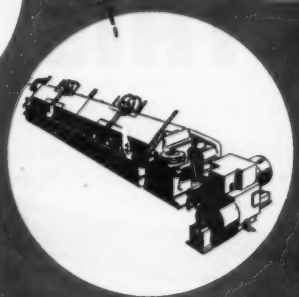
POWER PRESSES — Crank, Cam and Toggle; also Rack and Pinion Presses • Eyelet Machines • Multiple Plunger Presses • Horizontal and Hydraulic Presses, etc.



MILL MACHINERY — Rolling Mills: Strip, Rod, Wire Flattening, (For Ferrous and Non Ferrous Metals) • Also Slitters • Straighteners • Cut-off Saws • Coilers • Winders, etc.



SPECIAL MACHINERY — Sendzimir Mills • Small Arm Ammunition Machines • Collapsible Tube Machines • Coining Mills, etc.



WIRE MILL EQUIPMENT — Continuous Wire Drawing Machines (Upright Cone and Tandem) • Wire Flattening Mills • Chain Drawing Benches • Pointers • Swagers • Bull Blocks • Stringup • Machines • Spoolers, etc.

HERE'S A SAMPLE of Waterbury-Farrel mass production equipment in action. This complete WF automatic production unit combines a 40-ton double-acting, upright blanking and cupping press, a conveyor feed and four 7-station horizontal drawing presses to draw 240 zinc shells per minute.

Within These Basic WF Equipment Lines, Individual Machines Are Custom-Engineered For Specific Applications

If your metal-working machinery problem falls into any of these five groups, there are good reasons for looking to Waterbury Farrel for the answer.

There's Waterbury Farrel's continuing engineering research with more than a century of machine building experience to draw upon. This results in soundly designed and thoroughly tested features which improve production.

There's Waterbury Farrel's world-wide reputation for rugged, long-lasting construction. This gives you the assurance that WF machines are built to provide long years of uninterrupted production.

Waterbury Farrel can custom-engineer special equipment or adapt a standard machine to fit your specific problem.

For further information, write for free booklets on any of the machines mentioned on this page or contact your nearest WF office.

FOUNDED WATERBURY FARREL 1851

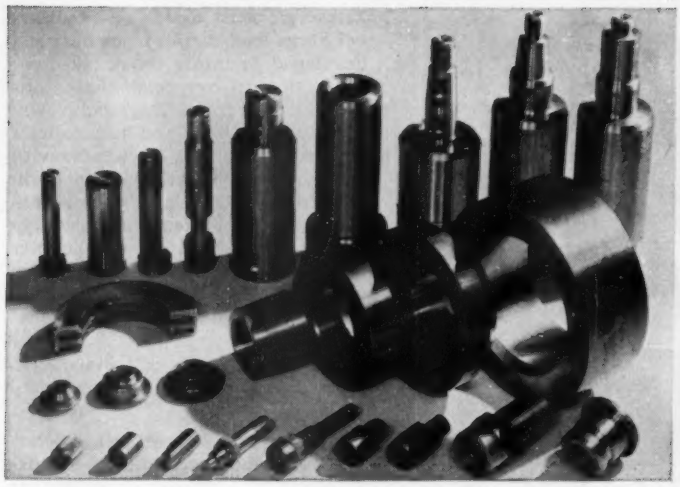
WATERBURY FARREL FOUNDRY & MACHINE CO. • WATERBURY, CONN.

Offices: Chicago, Cleveland and Millburn, N. J.

MACHINABILITY
LIKE THIS

6 HELPFUL MANUALS

filled with how-to-do-it information and data to help you use Republic Union Cold Drawn Steels. Write for "Union Drawn Pocket Library."



can cut your unit costs

Here's a suggestion:

Take any one of the parts shown above — any steel part, for that matter. Make it out of ordinary cold drawn steel. List your unit costs.

Then make the same part out of Republic Union Cold Drawn Steel. Like many others, you may find that the uniformly high machinability of Republic Cold Drawn Steels can help your unit costs look their best.

We have the facts to prove it. Not only from our customers, but right in our own plant where we pre-test this machinability on our own "automatics."

And to help you get the most in machinability from Republic Cold Drawn Steel, we will be glad to send one of our metallurgists or machining engineers. He will visit your plant, swap ideas on speeds and feeds with your plant men and engineers. He will work with your staff to see that you get high production efficiency, low unit costs, long tool life, and uniformly high product quality. Call your nearest Republic sales office for the facts. Or write to:

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Free-Machining Bessemer, Alloy and Enduro Stainless Steels

Union Cold Drawn Special Sections

Union Cold Drawn and Ground Rounds, Turned and Polished Rounds, and Turned, Ground and Polished Rounds (Union Precision Shafting)

REPUBLIC *Union* COLD DRAWN STEELS

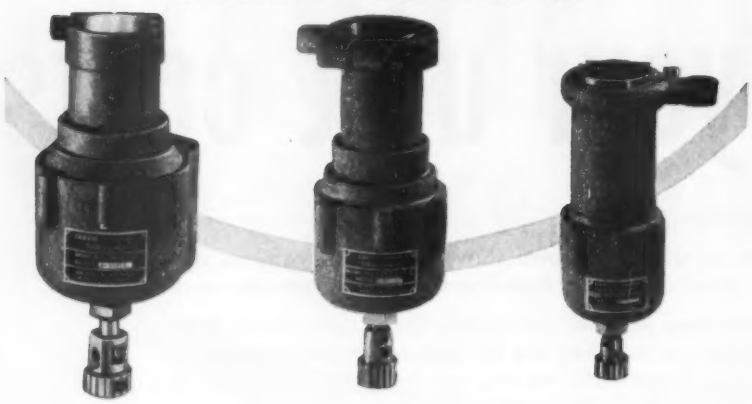
REPUBLIC STEEL

It's 3 to 1

a Jarvis TORQOMATIC

can do your tapping jobs better

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS



A complete range of Jarvis Torqomatics — available to fit any type drill press or tapping machine.

You'll like their trouble-free performance — their ability to produce quality threads — their increase in tapped holes per hour, the savings in taps — and their ease of operation!

We invite your inquiries about these highly efficient Jarvis Torqomatics that have outmoded all other slow, expensive and highly perishable machines of the past. Jarvis Torqomatics are priced low enough to make it economically possible to replace your old tapping devices and attachments.

A Jarvis representative will be glad to consult with you — no obligation.

Send for Complete Catalog.

JARVIS POWER TOOLS

TAPPING ATTACHMENTS
TAPS · FLEXIBLE SHAFTS
AND MACHINES
ROTARY FILES
TUNGSTEN CARBIDE
REAMERS AND MILLS
DRILLS · BORING BITS

SPECIFY YOUR NEW DRILL PRESS BE JARVIS TORQOMATIC EQUIPPED

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Telescopic mast design on the Market Forge load-carrier truck has been developed to insure quick and easy connection to overhead chain conveyors. Mast is quickly and easily raised by one hand and automatically locks in position. It engages with a special coupler attached to chain conveyor so that it is guided into position without requiring accurate placement. Hinged dog on coupler prevents truck from coasting when chain is stopped. Quick release on mast insures instant disengagement from coupler.

Market Forge Co, Materials Handling Div, Everett 49, Mass

Vitroplast acid-solvent-grease-detergent-resistant cement has been developed as a corrosive-resistant product for joining brick or tile on floors or tanks. Unlike most chemical-resistant cements, it sets hard in contact with a wide variety of surfaces and a large number of metals including steel; has outstanding adhesive properties and can be used to join many different solid substances. Working time is approximately 40 min, setting time less than 2 hrs at ordinary temps. Available in white, black, or colors.

Atlas Mineral Products Co, Mertztown, Pa

L/D cut-wire shot for cleaning, peening, tumbling, cutting, abrading, is cut from high-grade wire to form cylinders so that the length of each cylinder is equal to the diameter of the wire, as a uniform in size, uniform in hardness abrasive. Shot is available in steel, copper, and stainless in a range of wire diameters from 0.0625 to 0.020 in. with minimum hardness range for the steel shot of 36R_c to 46R_c depending upon wire diameter. For special applications shot can be produced from any type of wire, and sizes can be varied.

Harrison Abrasive Div, Metals Disintegrating, Elizabeth, NJ

Two all metal, self-locking, floating anchor nuts in a wide variety of sizes are now available in both one- and two-lug designs. One-lug is made in 6-32, 8-32, 10-32, and ¼-28; the two-lug is being manufactured in those sizes and 5/16-24 and ⅜-28 thread sizes. Both nuts withstand temperatures to 550 F. They meet envelope dimensions of proposed military standard drawings and conform to applicable requirements of current specifications AN-N-5 and AN-N-10.

Nutt-Shel Co, Inc, 811 Airway, Glendale 1, Calif

Jarvis TAPS

AN INDUSTRIAL TAP FOR INDUSTRIAL USERS

have "Custom Made" Cutting Edges at NO EXTRA CHARGE

"Custom Made" means just that! Accurate indexing and precision machine grinding of flute and spiral points on Jarvis Taps produce a tool in which ALL the cutting edges do their share of the work. Our highly accurate fluting process makes it possible for us to control for your PARTICULAR NEEDS the amount of hook ground in the flutes. Specify Jarvis, and you'll always have "Custom Made" Taps designed to do a specific job superbly well.

Send for complete Tap Catalog now—also name of your nearest Jarvis representative.

JARVIS POWER TOOLS
include:
**TAPPING ATTACHMENTS • TAPS
ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • TUNGSTEN CARBIDE REAMERS and MILLS • DRILLS
BORING BITS**

**THE CHARLES L. JARVIS CO.
MIDDLETOWN IN CONNECTICUT**

OUT OUR WAY

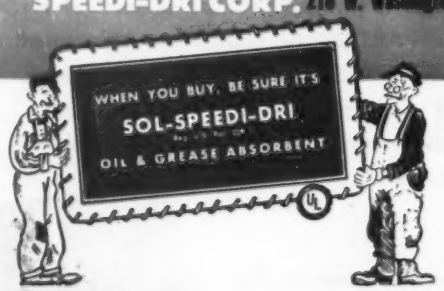
THANKS, BURL, FOR HELPING US OUT--I'VE PUT TWO HELPERS ON, AND ALL YOU'LL HAVE TO DO IS SIT HERE AND RUN THE WORKS!
IT MUST BE SECOND NATURE THE WAY HE HAULS OUT THAT CHAIR WHENEVER A GUY SLIPS IN THE GREASE!
YEAH--HE'LL NEED TWO MORE CHAIRS FOR THE HELPERS IF HE DOESN'T GET SOME SOL-SPEEDI-DRI ON THAT FLOOR!
THE SLIGHT SLIP
J.R.WILLIAMS

Industry's remedy for slick, oily floors

SOL·SPEEDI·DRI

For clean, slip-proof floors, you can't beat "dry cleaning" with Sol-Speedi-Dri. Industry buys more of it than any other oil and grease absorbent, because pound for pound, dollar for dollar, Sol-Speedi-Dri gives *more for the money*, all factors considered. Check plants near you, and you'll see what we mean. Send coupon today for free sample and literature.

SPEEDI-DRI CORP. 218 W. Washington Sq., Philadelphia 5, Pa.



Warehouse stocks maintained in principal cities of the United States and Canada.

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Inquirers in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Phila. 3, Pa. In Canada, G. H. Wood & Company Ltd., Toronto. Branches throughout Canada.

FREE SAMPLE Fill out the coupon and mail today for free sample and literature.

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*City*_____ *State*_____

AM2-1/54

Photo-chemical nameplates can be made by a process by which ten reproductions can be turned out at a unit cost almost as cheap as for a quantity of 500. Can be supplied on any non-porous surface, and are also obtainable on 0.003-in. thickness of aluminum foil backed with a high tensile bonding material. Process is able to reproduce 120-line, half-tone prints, and when reproduced on a non-combustible material, they are unaffected by heat or cold; flame will not destroy the image.

Henry G Dietz Co, 12-16 Astoria Blvd, Long Island City 2, NY

Welders' test kit conforming to Air, Navy, Ordnance specification MIL-T-5021 consists of two clusters, 1 plate, 2 crosses, 2 sets of tubes; all are made of chrome molybdenum. Also included are all necessary application forms. The CBC kit can be used for practice as well as taking the test by government inspectors.

CBC Welding Corp, 422 E 102nd St, New York 29, NY

Lock nut with free spinning characteristics has been designed to ride over corrosion products deposited on threads of bolts and screws, thus eliminating galling and seizure problems normally experienced in high applications. The 1700 G series withstands temp up to 1200 F; the 1700 F series is used where temperatures reach 1600 F. Sizes: 10-32 NF-3 through ⅜-24 NF-3. Nuts meet specifications MIL-S-5059 and AN-S-126.

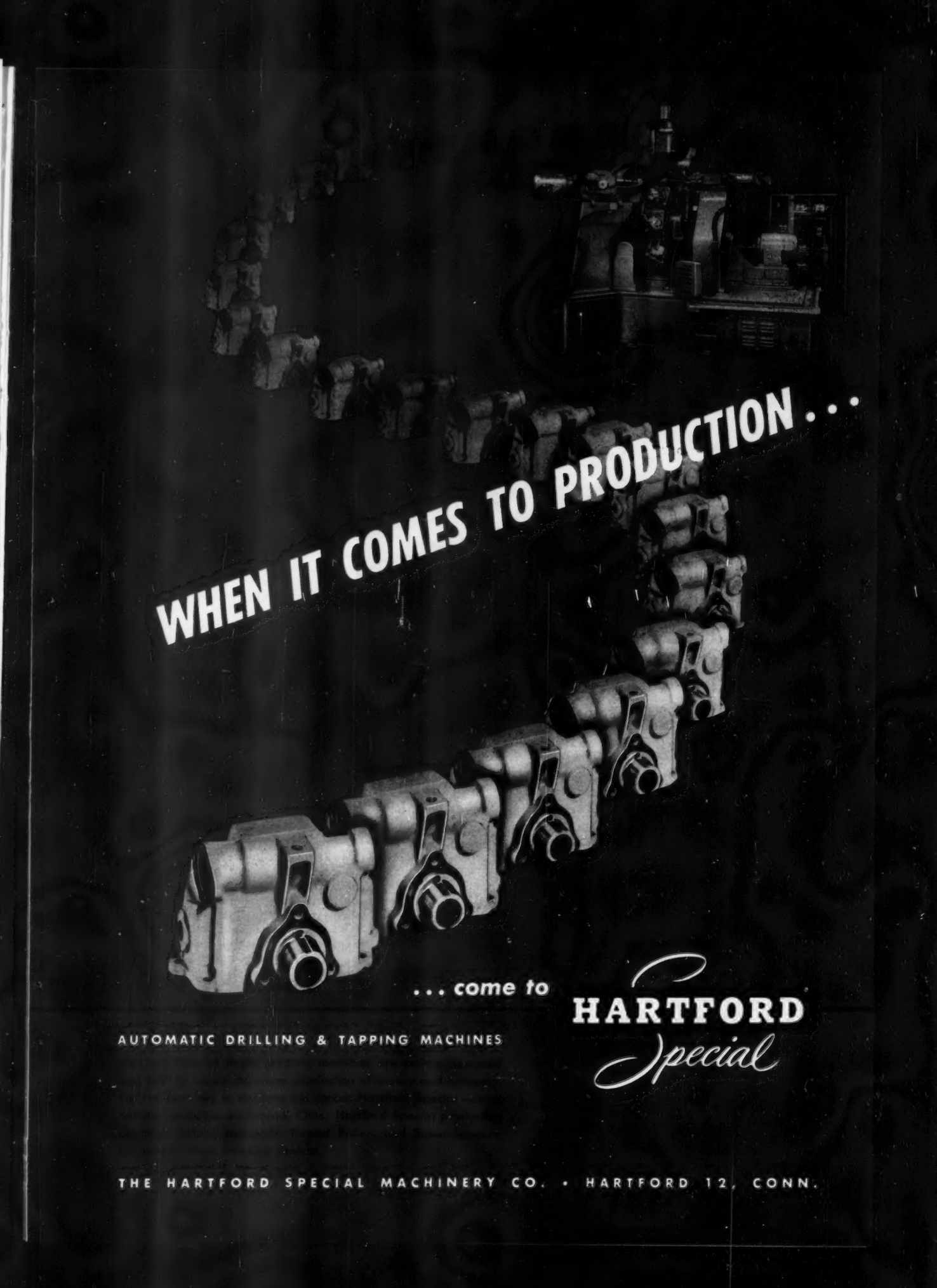
Nutt-Shel Co, Inc, 811 Airway, Glendale, Calif

Milling cutter has been designed to hog metal at higher speeds with heavier cuts. Spiral serrations break metal chips into small particles, thus eliminating excessive friction and heat. In mild steel, tool life has been reported as high as 60 hours between sharpenings. Although designed to increase rough cutting speeds, it does produce a fairly finished cut. Available in sizes from 7/16 to 2 in.

Precision Industrial Tools, 5937 North Knox Ave, Chicago 30, Ill

Series of permanent magnet dc motors and gear motors is available supplied with overload-torque-limiting clutches. Miniature units measure 1 3/16 in. in diameter by 4 in. in length; output speeds can be varied, by changing the gear set, to as little as 1 rpm.

Mission-Western Engineers, Inc, 132 W Colorado Blvd, Pasadena 1, Calif


WHEN IT COMES TO PRODUCTION . . .
. . . come to
HARTFORD
Special
AUTOMATIC DRILLING & TAPPING MACHINES
THE HARTFORD SPECIAL MACHINERY CO. • HARTFORD 12, CONN.

Here's a Handy Chain for Positioning Loads

• The short links in this 125 Endweldur ACCO *Registered* Sling Chain can be wrapped around small projections and over sharp corners. The greater tensile strength of the alloy material permits use of light weight chain that is easy for the machine operator to handle. The two 6-foot legs can be used as a double bridle, double choker, or in a double basket hitch as illustrated.

This is only one of many types of ACCO *Registered* Sling Chains available for lifting castings, sheet steel, pallets, machines, machine parts, quenching baskets, and the like. You can get AMERICAN Sling Chains as small as ¼" or as large as 1¼"—with sling, grab, or foundry hooks—or special hooks for plates, etc. They are all individually proof-tested, registered, and an identification ring is permanently attached.

See your AMERICAN CHAIN distributor today or write our York, Pa., office for copy of DH-130

ACCO

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

American Chain

Steelhard flooring compound has been improved to enable it to withstand loads up to 20 tons. Product can be used to patch or resurface any concrete, indoors or out, and is reputed to be ready for use within 4 to 6 hours after installation. New application process produces an extra smooth finish in a light gray color.

The Monroe Co, Inc, 10703 Quebec Ave, Cleveland 6, Ohio

Live pilot bearing bushings are available in a complete range of 50 standard sizes for tool piloting applications requiring absolute seal of bearing cavity from abrasive action of grit and coolants. In all sizes of the new bushing, tapered bearings can be adjusted to compensate for wear, and are adaptable to receive removable slip bushings as well as key or key-ways.

J G Jergens Co, 11106 Avon Ave, Cleveland, Ohio

Sapolin's fast-drying aluminum paint can be used to plate all high-heat metal surfaces with one coat; bright silvery finish prevents rust, cracking, or peeling. Product withstands temperatures up to 1200 F without discoloring or blistering; finish fuses with the metal as temperatures are increased. Ready-mixed, it can be simply applied by brush or spray, drying hard in 30 min.

Sapolin Paints Inc, 229 E 42nd St, New York 17, NY

Link-Belt PIV positive, infinitely variable speed drives are now available in two new types for 20 to 25 hp applications. In addition to the basic H-6 PIV of 25-hp capacity, an HG-6 drive, furnished with either single reduction input or single reduction output helical gear attachment is being manufactured, and an HGG-6 drive, furnished with both a single reduction input and a single reduction output helical gear attachment. The three types have a wide range of ratios and assemblies.

Link-Belt Co, 307 N Michigan Ave, Chicago 1, Ill

Molykote Type BR2, a multi-purpose EP lubricating grease, has been developed for highly-loaded ball and roller bearings and heavily loaded sliding friction surfaces. Compound is an oxidation-inhibited, lithium-base product, fortified with Molykote Type Z. Operating range is from –80 to 350 F.

The Alpha Corp, 179 Hamilton Ave, Greenwich, Conn

A Century MOTOR With Gas Mask PROTECTION

Underwriters Approved

EXPLOSION PROOF MOTORS

Take a look at these Century Explosion Proof Motor features:

- Vital motor parts protected—sealed into inner frame.
- Motor can be reversed without changing direction of the fan—fan runs in either direction.
- Uniform ventilation surrounding outside of inner frame.
- Smooth, straight-through ventilating passages.
- Winding electrically insulated 6 different ways.
- Unusually free from vibration.
- Ball bearing housing keeps grease in—dirt out—lubricated for several years' normal service, with grease plugs for additional lubrication, if necessary.
- Easy-to-remove fan guard is held securely in place with two screws.
- Smooth exterior surface is easy to clean.
- Cast iron frame with integrally cast feet resists rust and corrosion—even when mounted in places where processed materials may contact the feet.
- Rugged construction gives generous safety factor for rough handling.

CE-760

Your property and employees are protected, because this Century Explosion Proof motor is totally enclosed—sealed to prevent a motor spark from causing an explosion.

Class I, groups C and D are used in atmospheres containing flammable gases or vapors: Ethyl ether vapors, gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors and natural gas.

Class II, groups E, F and G are used in atmospheres containing combustible dusts: Metal dust, carbon black, coal or coke dust and grain dusts.

Naturally, corrosive or abrasive materials in the air are also sealed out of the vital parts.

For your protection, specify Century motors on new equipment or for replacement. Your nearby Century Distributor will be glad to give you full information on the complete line of Century motors—from 1/8 to 400 horsepower. We are limited in some sizes of the Explosion Proof motor.

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

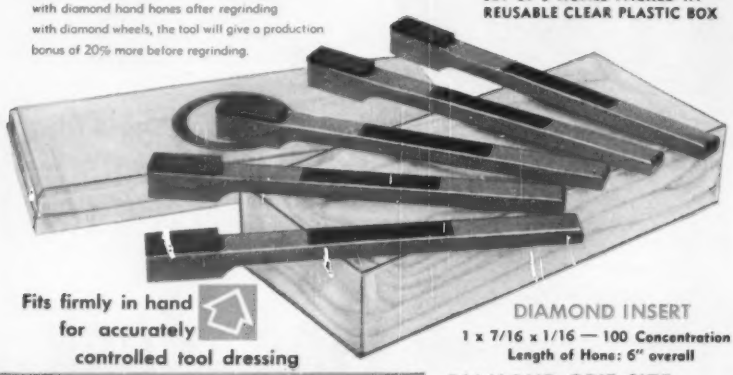
GIVE YOUR CARBIDE TOOLS "THE BONUS EDGE"

20% LONGER TOOL LIFE BETWEEN REGRINDS

Diamond hand hones with "finger-tip" control

If the edge of a carbide tool is properly honed with diamond hand hones after regrinding with diamond wheels, the tool will give a production bonus of 20% more before regrinding.

SET OF 5 HONES PACKED IN REUSABLE CLEAR PLASTIC BOX



Fits firmly in hand for accurately controlled tool dressing

DIAMOND INSERT
1 x 7/16 x 1/16 — 100 Concentration
Length of Hone: 6" overall

for all general shop requirements

SINGLE END.....

DIAMOND GRIT SIZE

No.	SINGLE END
1	100
2	150
3	220
4	320
5	400

$7.50

In lots of 6 sets $5.00 off per set

complete range for all tool cutter finishing

DOUBLE END.....

No.		DOUBLE END
6	100	320
7	150	320
8	220	320
9	400	320
10	600	320

$13.85

In lots of 6 sets $7.50 off per set

United States Diamond Wheel Company offers constant fine quality in its complete line of diamond grinding wheels for giving your carbide tools "the BONUS edge".

Scientifically controlled bonds perfected to do the best cutting job consistently, economically.

Send for catalog showing complete line of products

UNITED STATES DIAMOND WHEEL CO. AURORA, ILLINOIS

Barnaby non-releasing tap holder is equipped with cylindrical guide for smooth, exacting work. Pull-out type holders will monitor the most severe tapping operations without sticking or jamming. They can be used on turret lathes as well as screw machines for holding taps while cutting internal threads. Units are designed to incorporate a small amount of float to correct any slight misalignment. One Barnaby hinged shoe bushing blank is furnished with each tap holder. Available in three sizes, ranging in price from $10 to $13.75 each.

Barnaby Mfg Co, 74 Knowlton St, Bridgeport, Conn

Floating torch assembly which permits uniformly accurate bevel cutting regardless of humps, bows, or other unevenness in steel plate has been developed by National Cylinder Gas for use with its Cut-O-Matic portable cutting machine. Guide wheel, which rests on plate being cut, controls distance between torch tip and plate. It automatically raises or lowers torch to compensate for any unevenness present in plate which otherwise would change the line of bevel. Torch is equipped with a swivel head which permits tip to be rotated to cut whatever angle of bevel is required for subsequent welding operations.

National Cylinder Gas Co, 840 N Michigan Ave, Chicago 11, Ill

Carlon "V" rigid plastic pipe is said to have exceptional chemical resistance and immunity to rot, rust, and electrolytic corrosion. Relatively high structural strength and dimensional stability make it especially suitable for numerous applications where chemical, atmospheric, and electrolytic conditions create maximum maintenance costs in the use of metal pipe. High dielectric strength, low water absorption, and non-flammable characteristics make it especially useful as an electrical insulator and for conduit.

Carlon Products Corp, 10225 Meech Ave, Cleveland 5, Ohio

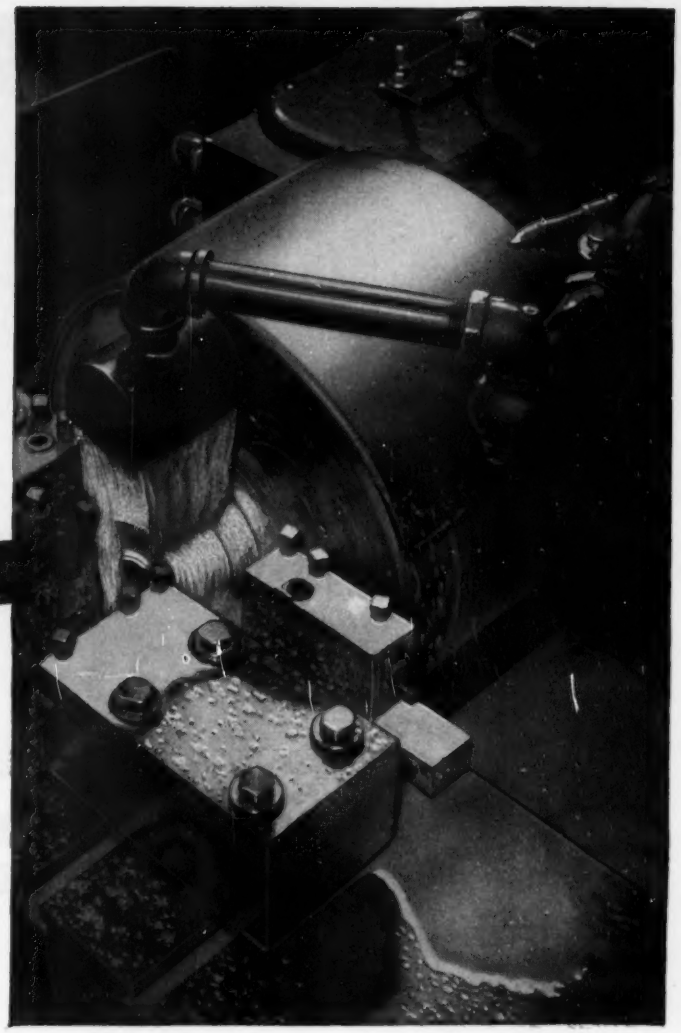
Brulinsolv concentrated solvent emulsion cleaner has been introduced for cleaning oil, grease, and dirt from metal surfaces. When mixed with low-cost solvents such as kerosene, concentrate steps up cleaning action of solvent; surface can be flushed with water; product is non-toxic and non-corrosive.

Brulin & Co, Inc, Dept 287, 2939 Columbia Ave, Indianapolis 7, Ind

YOU BE THE JUDGE FOR

DASCO

SUPER SOLUBLE BASE



THE trial of Dasco in many plants has led to this judgment: Dasco Super Soluble Base is a heavy duty water-mix cutting fluid base of unusual versatility. It gives superior performance in mixtures of 1-40 and higher for turning, boring, reaming, drilling and milling and 1-100 and higher for grinding. Only unusual operations may require richer mixtures

TRIAL 1 OPERATION: Turning complete O. D. Nozzle insert for Rockets, B1117 steel

Dasco Performance: One part Dasco Super Soluble Base and 75 parts water on chucking machines increased tool life approximately 35%. Production increased from 50 to 400 pieces in 8 hours. Tool changes decreased from 27 tools per 8 hours using a competitive soluble oil to 12 tools per 8 hours with Dasco Super Soluble Base.

TRIAL 2 OPERATION: Drilling, counterboring and reaming 90MM Projectiles, A.I.S.I. 1055 forgings

Dasco Performance: Number of pieces per set of tools averaged 250 for a rich mixture of competitive heavy duty soluble oil. A 1-20 mixture of Dasco Super Soluble Base produced 500 pieces per set of tools.

TRIAL 3 OPERATION: Internal grinding of steel ring
Machine: Bryant Internal Grinder

Dasco Performance: A 1-150 mixture of Dasco Super Soluble Base replaced a 1-80 mixture of a competitive soluble oil. In addition the competitive product required a rust preventative. Dasco, even at the long dilution, has been in the machine over a month: no rusting has been experienced.

More Than a "Coolant" is Needed

D.A. Stuart Oil co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS
2729 S. Troy St., Chicago 23, Illinois
In Canada: R. W. Horsey Canada, Ltd.
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Check One: ☐ Have Stuart Representative Call
☐ Send Data on Dasco

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Now . . . revolutionize your finishing!

NU-TEX MOUNTED POINTS

grind...polish...deburr
in one easy operation

SPEED UP PRODUCTION

With new, extra durable NU-TEX Mounted Points, you can grind, polish and deburr all types of metals and plastics in one simple operation . . . eliminate filing, scraping, sanding or burnishing. Their soft, cushion-like action produces even, super smooth finished surfaces quickly and easily . . . makes them ideal for touch up work on dies and molds as well as for polishing and deburring precision instruments, automotive or aircraft engine parts.

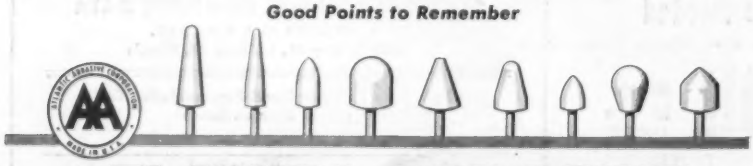
LOWER COSTS

Because they are bonded together with a special resin under an exclusive manufacturing process, NU-TEX Mounted Points last longer under continuous operation . . . eliminate clogging or loading, even on softer metals. Rigid tests conducted in the Standards Department of a leading automotive manufacturer prove that NU-TEX Points cut downtime to a minimum . . . provide a better polishing and deburring action than any other similar abrasive.

GET PROMPT SERVICE

When you specify NU-TEX Points, you avoid costly shipping delays . . . get prompt service on every order. NU-TEX Mounted Points are available in a complete range of sizes for every purpose. Try them for finer finishing. Write for details. Atlantic Abrasive Corp. 516 Pearl Street, South Braintree 85, Massachusetts.

Good Points to Remember



ATLANTIC ABRASIVE
CORPORATION
South Braintree 85, Massachusetts

ROUND TABLE Discussion

SUPER SALESMAN

How much leeway should the salesman be allowed in the shop? Once he has gained the foreman's confidence, should he be permitted to talk individually to the workers, or must his visits always be supervised?

I HAVE JUST READ the conversation between Al and Ed on "Super Salesman." I was very much interested because it was just this afternoon that we were discussing this very problem at the shop. My views are given here.

Management is maintaining and operating this shop for the purpose of showing a financial profit. They have hired the foreman and are paying his salary for the purpose of having him assist them in reaching this goal. If the presence of the salesman in the shop is not helping them to attain their objective, then he does not belong there and it is the foreman's job to see that he is promptly relocated to the proper place for the sales talk. It is my contention that by being out in the shop the salesman not only fails to assist the organization in reaching its objective, but is actually a serious detriment. His demonstrations and sales talk are time-consuming and distracting particularly if he is giving away "loot," so that the men are actually competing for an opportunity to listen to him. His presence in the shop creates an accident hazard, with the salesman or an employee as a potential victim.

It is very true that the salesman has an enviable position for gaining knowledge. His activities include what is probably the best method of learning. He learns by being exposed to definite, concrete problems. If he cannot come up with the answer, he has the research workers and laboratory facilities of his company in back of him.

How can a company best take advantage of his experience and know-how? Certainly not by having him roam about the shop, talking to individuals about the merits of his products. If the company and the foreman feel that the organization can profit from some information that may be forthcoming from the sales engineer, then they should arrange to have him give a supervised demonstration. This demonstration should

New!

Farrel-Sykes gear machine generates gears up to 33⅓% faster

greater accuracy—easier to operate

The new Farrel-Sykes "Twin-Head" gear generator cuts gears as much as 33⅓% faster than preceding models, with higher tooth accuracy and finish. This increased speed adds up to important reductions in your manufacturing costs.

In designing the machine, great consideration was given operator convenience. Setup time is reduced, the cutting operation performed automatically—at the touch of a button.

The versatility of the machine is shown by the accompanying list of gears and other parts it can produce. It will handle a maximum range of work with the greatest possible ease, speed, accuracy and economy.

Write for details of this modern gear generator.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Cambridge (Mass.)
Akron, Cleveland, Chicago, Los Angeles, Houston FB-884

Farrel-Birmingham ®

WILL CUT:

1. Sykes continuous tooth double helical gears
2. Double helical gears with wide or narrow center groove—teeth matched or staggered—helices of similar or dissimilar pitch
3. Single helical gears with external teeth
4. Single helical gears with internal teeth
5. Straight tooth (spur) gears
6. Straight tooth gears with staggered teeth
7. Straight tooth gears with internal teeth
8. Cluster gears
9. Spiral gears
10. Racks (when machine is equipped with special fixture)
11. Sprocket wheels
12. A variety of special contours

Form Grind your parts like these...

ENGINEERING AND DESIGN

Complete design and development work; prototypes. Manufacture of gears, splines, and many other types of parts, as well as complete gear box assemblies. **Send your blueprints now.**

CONTRACT GRINDING SERVICE

If you prefer to send out your gears and other precision ground parts for grinding, GEARGRIND'S Contract Grinding Division is your most economical source. Service is quick!

CORRECTIVE (SALVAGE) GRINDING—

For parts made by other methods, distortion in heat treating and errors in machining often cause needless scrapping of gears, splines, and many special-contoured parts. Let GEARGRIND'S Corrective (Salvage) Grinding Service save them for you.

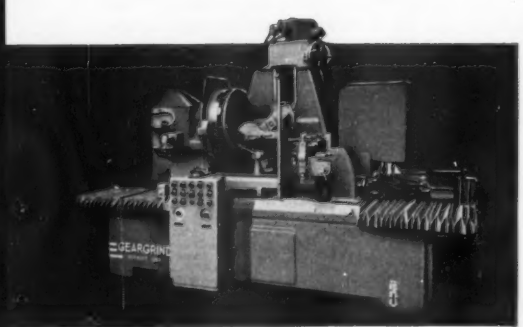
WRITE FOR FOLDER ON GEARGRIND'S CONTRACT GRINDING, ENGINEERING AND DESIGN SERVICE.

GEARGRIND

Range: 36 inches O.D. blank down to a fraction of an inch. Maximum capacity between centers: 80 inches. Special machines have been built to handle diameters up to 6 feet. Shown above is External GEARGRIND Machine, model GG10X48A.

...on Geargrind Automatics

For Speed and Versatility

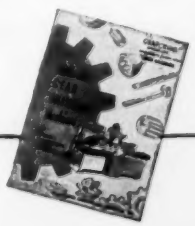


Internal GEARGRIND Machine, model GGI-16-3A

Actual operating experience shows: these automatic GEARGRIND Machines will equal or exceed the **continuous production rate** of other similar-purpose machines. And, they will do a greater variety of work: **aircraft, automotive, machinery, etc.**

SEE GEARGRIND'S NEW AUTOMATICS AT WORK!
COMPARE THEIR SPEED, ACCURACY, AND VERSATILITY
OR—SEE THEM PICTURED AND DESCRIBED

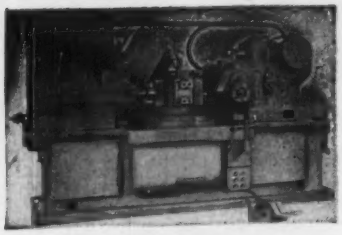
—with the complete line of machines, pioneered and developed over 45 years by Geargrind, in the new 8-page catalog. It's yours for the asking . . . write on your company letterhead, please.



THE GEAR GRINDING MACHINE CO.

3919 CHRISTOPHER, DETROIT 11, MICHIGAN

Here's what is meant by "1·2·3" in the GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINE



The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece simultaneously or in sequence, *without changing set-up* or rehandling. It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS & DELEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

be arranged for a particular purpose, which is presented to the sales engineer as a definite problem. The foreman should see to it that those employees and supervisors directly related to this particular work are called in to witness the demonstration. If the foreman decides that the product has merit, in this case the grinding wheel, he can order a sufficient quantity for a fair trial.

Clifford Molloy
Bronx, NY

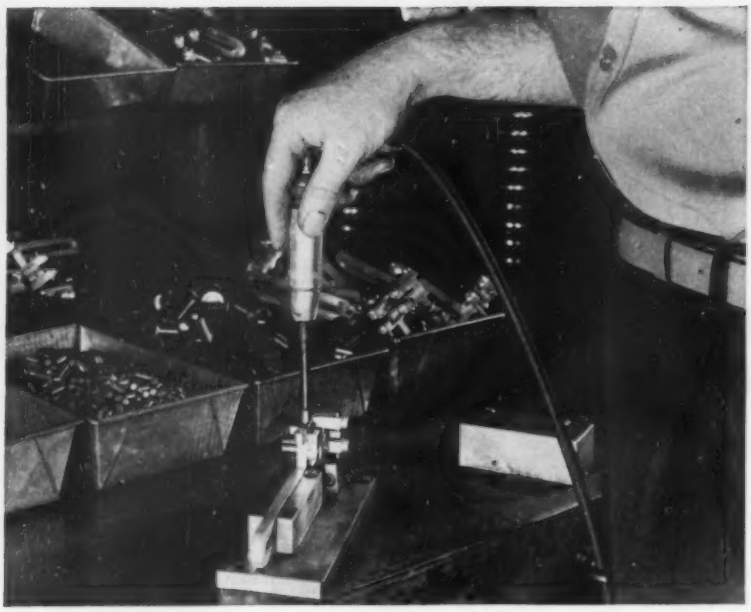
THE ENGINEERING SALESMAN, by and large, is an individual who commands my highest admiration. He's an overworked, underpaid, much-traveled exponent of mechanical progress who many times proves to be the Moses who leads us out of the wilderness of chaos and despair into the light of order and accomplishment.

For instance, I am trying to draw a difficult steel stamping. The metal tears. I ease off the hold-down pressure; the metal tears. I relieve the die edges; the metal tears. I realign the die; the metal tears. I put the die on air cushions; the metal tears. I change the blank shape; the metal tears. I change the blank shape again and try another batch of steel; the metal tears. I call in a sales engineer and try a bunch of varied drawing compounds ranging from whale-oil soap to molasses; the metal still tears.

And then the sales engineer remembers a green-colored, expensive fish oil that was made for cases like this. We send out and get some, and we try it out. Immediately, my troubles are over; the stampings shape up beautifully with no sign of a tear. Sure, the stuff is expensive, but my blanks were costing me $6.87 each, so the cost is justified in this one case. And the engineer who recommended the stuff was not selling it. He was recommending a competitive product in order to help me out—and that's sportsmanship.

"Chip, please! It's words like those that gives profanity a bad name."

LARGE SIZES AND
INTRICATE SHAPES
CAN NOW BE FORGED
The press forgings produced by Cameron approach for the first time the broad field of intricate shapes and patterns that have been limited heretofore to steel castings. Thus, the many manufacturing advantages of steel forgings are made more widely available. These advantages include controllable grainflow characteristics and a uniformly high quality, free from internal defects such as porosity and inclusions.
The Cameron forging process opens the door to a great many design features which will aid in producing equipment of greater utility and at a lower cost in manpower and material.
FORGE AND ORDNANCE DIVISION
Cameron
IRON WORKS, INC.
HOUSTON, TEXAS
Scale
one foot



Saves ⅔ of Assembly Time with this 10-ounce KELLER SCREW DRIVER

The Keller Pneumatic Screw Driver shown above—Model 12D-2C—is used in assembling parts for a power band saw. It has increased production per man-hour to three times as much as it was before. Similar results are reported from other shops where it has been installed.

It is lightweight (10 oz) and well proportioned to fit the operator's hand. It has pneumatic pick-up and a pressure control. It is so easy to handle and use that it makes assembly a breeze.

Facts in Brief about **KELLER Screw Drivers**

- Weigh less—reduce fatigue
- Consume less air
- Interchangeable parts—wide variety of handles, gearings, torques, speeds
- Clutches, 45° and 90° attachments for every requirement

Send for descriptive literature and detailed information

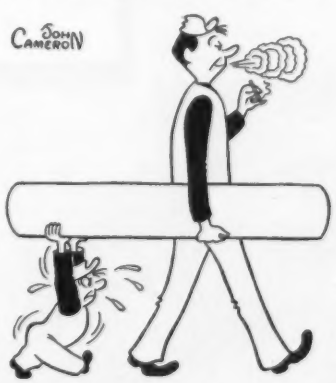
KELLER TOOL COMPANY

GRAND HAVEN, MICHIGAN

Another time I was examining and initialing a bunch of purchase requisitions for shop expense items. Then I stopped. Here was a requisition calling for $400 worth of welding and cutting torches, gages, pressure reducers, and fittings. Now it happened that this plant had already standardized on a complete line of torches and auxiliary equipment. Yet here was a request for a bunch of competitive material. I held up the request and investigated. There was a story.

A certain salesman had been smart enough to ferret out the name of the foreman who was using this type of equipment, and had arranged a meet on the outside. There was a matter of several dinners, a football game and a boxing match. Under the soothing aura of good fellowship, induced by a flock of suasive Sidecars which were used to bed down a 2-inch steak, and the super-induced salesmanship of a smart peddler, this foreman had seen the Light. Overnight, our previously satisfactory gas equipment had become a mass of drab junk, while the salesman's product shone out for the whole world to see, gems of beauty, sparkling and snapping under the refulgent light of a beautiful friendship. At the time, it was thought best to restrain gently this foreman's enthusiasm, and it was so restrained. It was also found even possible to struggle along with our own miserable, contemptible equipment, and we so struggled.

I, too, know about those beautiful friendships. So, while thoroughly approving of engineering salesmen, experience has taught me that many members of that delightful profession are too, too charming, too forceful, and altogether too highpowered to be turned loose on low-amperage shop foremen and mechanics, without a chaperone being present. Now I've always permitted these lads to speak to my boys—in my presence. I'm very good that way, but I want to be in the picture and function in



Certified BRAD FOOTE GEARS

Certified BRAD FOOTE PRODUCTS

Copper Plated

No increase in price!

A NEW WAY FOR YOU TO BUY GEARS

• Now you can specify by brand name the gears or assemblies you need and be sure that every desirable quality for longer life and lower service cost will be built into them. This name—*Certified* BRAD FOOTE Gears.

Certified BRAD FOOTE Gears are made according to an exclusive BRAD FOOTE formula which controls every step in the manufacturing process. It is your assurance that the gears will have long-wearing teeth and bearing areas, and tough cores that will give service equal to or better than any other gears made.

Copper Plating* permits smooth, quick run-in. It is clean and prevents rust and corrosion before gears are put in service. It's your positive identification of the best gears that money can buy. *Yet . . . you pay no more.*

The Certificate furnished with *Certified* BRAD FOOTE Gears and assemblies certifies strict adherence to specifications and the exclusive BRAD FOOTE formula. It proves that *"no one shares our responsibility."*

**Gears over 30" diameter are protected by copper-colored water-soluble paint which need not be removed before placing in service*

Write today for descriptive literature

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Pittsburgh 25, Pennsylvania

World's Largest Three-Coordinate Jig Boring and Milling Machine Installed at Hartford Special Machinery Company

The latest addition to the complement of fine precision tooling at the Hartford Special Machinery Company of Hartford, Conn., is the SIP Hydroptic 8P illustrated at the right. The photograph shows Hartford Special's President, Mr. Robert Merritt (in shirt-sleeves) proudly displaying the new acquisition to Mr. F. P. Maurice, Managing Director of the Societe Genevoise D'Instruments de Physique, Geneva, Switzerland. The machine becomes

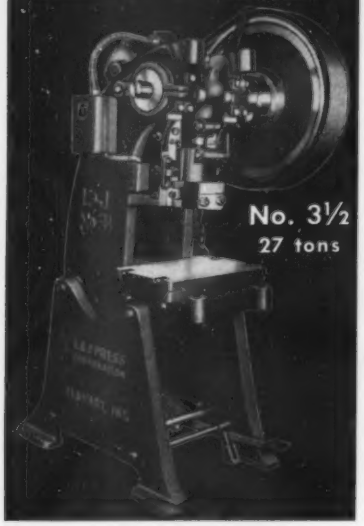
the fifth in the battery of SIP Hydroptics now in operation in Hartford Special's modern toolroom illustrated on this page.

The new Hydroptic 8P Jig Boring and Milling Machine, equipped with a 61.5" x 40.5" table, features a 55-inch table travel, a 40-inch traverse travel of the vertical spindle head, and a 28.5-inch vertical travel of the horizontal spindle head. Drilling capacity 2¾"; boring capacity 10". Hydraulic milling feeds up to 12-inch/min.

Three-coordinate settings, with standard scales magnified 21x are projected on viewing screens for both speed and convenience. SIP guarantees that the maximum error between any two positions of the table or the spindle heads compared with the readings on the projection screens is inferior to 0.0002 inches.

SIP Hydroptic Jig Boring and Milling Machines are in operation from coast to coast in the most prominent plants for high precision production and tool work. Their popularity is due in part to (1) their exceptionally large productive capacity, (2) ease and speed of operation, (3) outstanding flexibility and (4) the SIP tradition for permanent precision. These machines are distributed in the U.S.A. by American SIP Corporation, 100 East 42nd Street, New York 17, N. Y.

NEW
L&J PRESS



A new ruggedly built press with the capacity, rigidity and accuracy for a wide variety of precision work. It has the time-tested L&J features that give you more value for your money through better and more efficient press work.

SPECIFICATIONS

Strokes per minute	120
Ram stroke, standard	2½"
max. stroke (to order)	4"
Ram overhang, center of ram to frame	6¾"
Die space, standard*	8¼"
special,* up to	12¼"
Bolster plate area	21½" x 13"
Opening through back	10"

*bed to ram, stroke down, adjustment up

Let our local distributor show you the benefits of putting L&J Presses to work for you. 17 O.B.I. models—flywheel and backgear types—6 to 80 ton capacities. All available with L&J—Fawick Air Clutches for high-speed production.

Write for literature

L&J PRESS CORPORATION
1629 STERLING AVENUE
ELKHART, INDIANA

my well-known role of interpreter and monitor.

Unless there is a very real reason for breaking the rule, I prefer to limit the salesman's contact to the foreman and me. It makes it more cozy. Under no conditions is it desirable to permit a salesman to wander foot-loose and fancy-free around the shop without an escort. I never permit that practice, and, as a final check, I always have all purchase requisitions pass over my desk. So, when a foreman starts calling for Crown steel when we have always used Anchor steel, I know immediately that a salesman is making a good try, and that a little executive brain-washing is in order.

You can't kill sales engineers off for trying, because the government has a closed season on them, and they're a swell gang anyway; but their activities should be restrained to the proper channels, or the channels dammed up when they make new ones. The matter will never be settled at one meeting. Salesmen are too versatile, and they'll always be in there pitching. And who wants to change them? I admit a long-time fondness for them and their antics; I'm for them, but I keep a fatherly eye on them.

James K Matter
Detroit, Mich

•

WHEN IS A TOOLMAKER

Is it justifiable to promote machinist to toolmaker if the man has never served a formal apprenticeship? If he proves equal to the job, shouldn't his lack of apprenticeship be overlooked in favor of ability?

THE QUESTION of whether a machinist should be up-graded to toolmaker without having served an apprenticeship in toolmaking has another question in common with it to be answered first, namely, how many good, all-around machinists have served an apprenticeship? I dare say that the greater number have never gone through a formal training, still they must work as close as any toolmaker.

In toolmaking one must have a greater knowledge of mathematics than in machine work, which is the only difference between the two branches of the trade. Mathematics can be obtained by anyone who wants to advance.

The trend today is to call anyone who can run a machine tool a machinist, though the proper term is machine operator. This is where Ed went off the deep end. It would be wrong to up-grade a machine opera-

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drilling and boring machines?

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"... a great time-saver"

These manufacturers' catalogs are instantly available in Section 1 of your Machine Tool Catalogs:

Carlton Machine Tool Co.	Giddings & Lewis Machine Tool Co.
Cincinnati Gilbert Machine Tool Co.	Hydro-Borer Co.
Cincinnati Lathe & Tool Co.	Lucas Machine Division New Britain Machine Co.
Consolidated Machine Tool Corp. Sub. Farrel-Birmingham Co., Inc.	Ohio Machine Tool Co.
Davis & Thompson Co.	Snyder Tool & Engineering Co.
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ALSO: The following catalogs, in other sections of your Machine Tool Catalogs, contain information on drilling and boring machinery:

Armstrong Bros. Tool Co.	L & J Press Corp.
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Bullard Company	Norton Company
Dake Engine Company	O'Neil-Irwin Mfg. Co.
General Mfg. Co.	Pan-O-Mill Corp.
Gisholt Machine Co.	Rivett Lathe & Grinder, Inc.
Greenlee Bros. & Co.	Seneca Falls Machine Co.
Hall Planetary Co.	Sundstrand Machine Tool Co.
Heald Machine Co.	Taft-Peirce Mfg. Co.
Johnson Machine & Press Corporation	Thomas Machine Mfg. Co.
Jones & Lamson Machine Co.	Verson Allsteel Press Co.
Kearney & Trecker Corp.	Wales-Strippit Corp.
Knight, W. B., Machinery Co.	Warner & Swasey Co.

In other sections of the File you will find additional catalogs containing useful information on a wide range of machine tools and accessories.

Sweet's Catalog Service

Division of
F. W. Dodge Corporation
119 West 40th Street, New York 18, N. Y.

tor to toolmaking, but a good, all-around machinist who can operate any machine tool, do bench work assembling parts with close limits, should have the opportunity to do tool work if he so desires.

I never served an apprenticeship, but by working in different plants I have been a machinist, toolmaker, toolroom foreman, tool designer, chief tool engineer, and master mechanic of tooling. During World War II I was called in and ordered to set up a plant to make our first guided missile; only two plants in the United States would take on the project. If I hadn't been up-graded along the line and been given a break, I could never have done this to the satisfaction of all concerned.

Therefore, I say give the boy a break if he has the guts to want to try. It will be up to him to burn the midnight oil and get the math. In giving him this break, treat him as you would want to be treated yourself,—there was a time when you didn't know it all (if you do yet).

E C Porsberg
Northfield, Ohio

•

INDIAN GIVER

Should a foreman have the authority to arrange occasional special vacation schedules for the men under him, or is this the prerogative of the personnel department? Does the foreman or the front office know better as to when the work load will allow special treatment?

IN ANY MANUFACTURING PLANT, a foreman worth his hire is a man who knows the men working for him, and management should recognize him as such. He knows the work his men are doing, their moods, likes, and dislikes. And he will act according to the job he has to do—decide which men will do a certain job when, and how. He will change a man's job when necessary, and many times for more than one reason.

Men who work in a manufacturing plant are not machines. A machine when it is set up correctly will function the same way on the same material indefinitely. But even a machine—when set up to turn out bolts—will not function the same if the steel bars are changed from mild steel 1020 to a chrome nickel steel. The setup will be the same, but tool cutting angles will have to be changed, and sometimes cutting fluid will have to be changed, too.

But manpower is a different element to be dealt with, and a foreman who is on the job, and knows his men, has to deal with them in

Webber

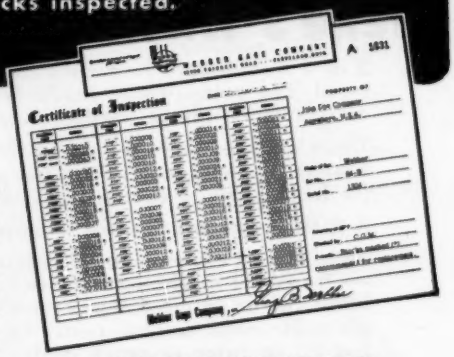
Don't invite controversy!

Have your gage blocks inspected periodically

$16.50 for an 84-block set.

Smaller sets proportionately lower

. . . all makes of blocks inspected.



Don't allow wear in gage blocks to cause unexplained difficulties in assembly. When trouble develops start checking the blocks immediately.

If they have been used daily for any long period of time they should be examined just to make sure their accuracy is still within tolerated limits. Better yet send them to us before trouble occurs. You may find that only a few blocks need replacement.

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INSPECTION SERVICE INCLUDES:

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2. Removal of burrs and nicks which impair accuracy.
3. Notation of degree of wear of each block.
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The Reference Point for Accuracy

LET'S TALK FACTS
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"This NELCO solid-brazed, carbide tipped mill is the best tool we've got. We get the most for our money — it's solid, rugged and dependable . . . gives better finishes, higher table feeds and turns out more work between grinds. Boy! It's a Honey!"

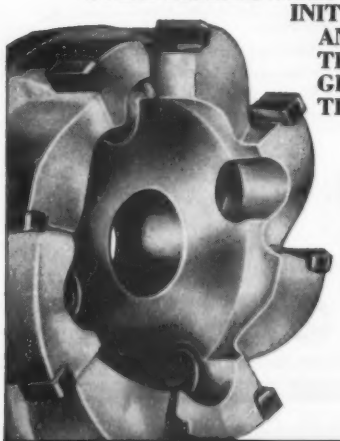
HERE'S WHY...

2 or 3 solid-brazed face mills cost *less* than 1 inserted blade type! The same initial investment provides 1 or 2 *spare* cutters which can be used while grinding the original.

There's less chance of damaging rugged, one-piece solid-brazed type cutters. No moving parts to keep aligned! . . . No loose parts to shatter, to accidentally injure workers.

A SOLID tool *has to work to closer tolerance!* It's a fact!

Solid-brazed cutters can be repaired *quickly* when damaged — No costly machined body to be re-worked or replaced. 1 blade for an inserted type cutter costs as much as 3 to 5 replaceable solid carbide cutter tips. The solid-type face mill has up to twice as much usable carbide. THEREFORE — SOLID-BRAZED FACE MILLS GIVE YOU—MUCH LOWER INITIAL COST — LOWER MAINTENANCE COST — FASTER PRODUCTION — CLOSER TOLERANCES — GREATER SAFETY and LESS DOWN TIME!



THESE ARE FACTS!...

Solid-brazed type face mills are NOT GADGETS . . . they're dependable, accurate, production-proved 1 PIECE cutting tools.

***Benefit by* proving these face-mill-facts on your machines NOW!**

NELCO TOOLS *For that Extra Edge in Production*

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

the same way as he deals with different metals—with men more so, as they are of different temperaments.

Many doctors advise men in different occupations to take a vacation to get away from their everyday struggle for a few days, or weeks, in a different environment. When they come back they are ready to continue with their job more efficiently than before.

So when Ed promised Dick Hartley and Tom Jones to let them go hunting for a week, the boss should not change that for many reasons. First, if a man is put in charge of a department to do a certain job, and he has men under him, certain rules are set up to be governed by, and if the rules are changed for any reason whatever, they are given a time limit as to when such a change is to take effect. If Ed promised some of his men to be let off prior to said change, he is duty-bound to keep his promise, and the boss is duty-bound to see that that promise is kept, as Ed is his direct representative.

If a foreman does do something that is against company rules, but can show that it was done in the company's interest, not personal, he should be backed up by the boss, as the foreman knows his men better than the head office.

A foreman can always figure his job better than any personnel department. The personnel department is very essential in a big establishment as a whole, but in individual cases the foreman is the man to handle his men as he sees fit, as he knows when he can spare men from a certain job and still be able to produce, and continue to meet and feed production assembly lines.

If some concerns make it a policy that the personnel department must give written permission to a foreman to allow a man to take a couple of days off, something is seriously wrong. The situation that Ed was

"I wish you'd do your reducing at home, Snodgrass—you're holding up production."

eliminate the guesswork in selecting tool steels

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

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HERE'S AN EXAMPLE:

Application — Deep drawing die for steel

Major Class — Metal Forming — Cold

Sub-Group — Special Purpose

Tool Characteristics — Wear Resistance

Tool Steel — Airdi 150

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TOOL STEELS

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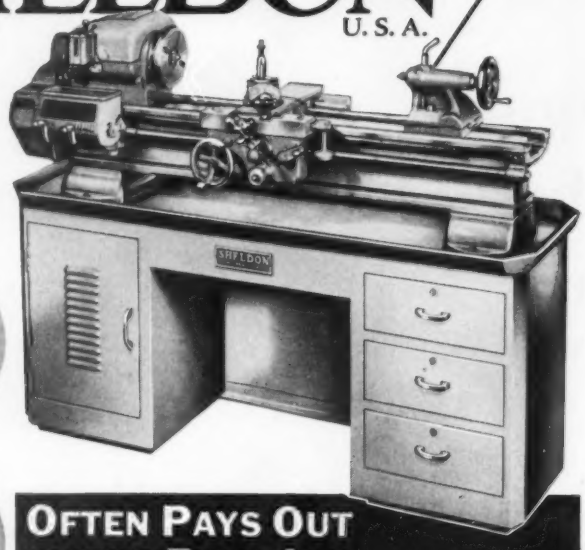

OFTEN PAYS OUT ON THE FIRST JOB...
and gives additional years of "cost free" service.

In the past, lathes were generally bought as large and as heavy as possible to insure accuracy and sufficient power. Now, with accurate, low-cost Sheldon Precision lathes, it is more profitable to buy these faster, cost-cutting lathes for the specific job at hand just as you would buy jigs and fixtures.

In savings of tooling costs, operator cost, power cost, and plant loading, as well as extra profits from more pieces per hour, Sheldon lathes often pay back their cost on a single run.

Sheldon lathes will work to the closest tolerances—have "Zero Precision" Taper Roller Bearings. They can take a healthy cut when operating at high speed direct drive—have double V-belts to the spindle. They will swing 10", 11" or 13" and have a 1⅜" hole through the spindle—have sufficient capacity for the great bulk of lathe work. Sheldon lathes have created a new factor for figuring machinery costs. They are tools you should know about.

Write for Catalog

SHELDON MACHINE CO., INC.
4234 N. KNOX AVE., CHICAGO 41, ILL.

put in will not only make him a laughing stock in his own department, but the company will lose by such action. Jones and Hartley, having made plans to go hunting, and then forced to cancel the plans at the last minute, will not be able to do their best on their jobs, and the other men in the department will follow suit.

There are exceptions; emergencies are different. Then every man has to stand by. If it is explained in the right way, so that it is understood, there will be no resentment on the part of the foreman or the men.

Michael Axler
Los Angeles, Calif

•

BACKWARD FOREMAN

Must a foreman be able to run all the machines in his department? Can he keep the respect of the men if his knowledge is more along leadership lines than practical experience?

IS IT NOT A QUESTION of what is thought to be needed; is it a super machinist? Then let Al have his way; it may be that a man who demonstrates machine capabilities would fill the bill, but it would be wise to look at all sides of the question before deciding.

To become efficient on all kinds of machines would take a very long time, and in these days of specialization such a training could have but a limited value. A man so trained might be less of an expert than a jack of all trades, and of more use in a small jobbing shop than in a shop full of high-class equipment.

If it be a foreman that is needed, a man to lead, then the question is vastly different. Such a man should certainly have knowledge of the art of cutting metals, and the principles of production. This, coupled with skill in one of the master trades (preferably many-sided turning), supported by good horse-sense, the capacity to see and foresee, to think and to control, would soon command the respect of the men in the shop who would speedily recognize that the new foreman was a Manager.

Good foremanship is something more than skill at the tools; it is a matter of brains and personality as well. The village idiot could be the fastest runner, or the strongest man; he might be clever with his hands, but he would still be the village idiot. The use of faulty standards needs to be avoided, or "back," not "fore" men may be appointed.

P E James
Lincoln, England

CUT MILLING COSTS WITH

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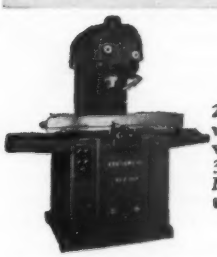
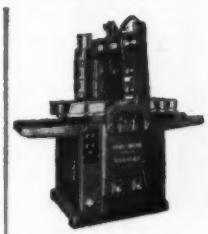
Speed and Accuracy!

No. 2-20
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

More and more—Kent-Owens Machines get the call for countless milling jobs today—because they're *rugged . . . simple . . . versatile.* Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to cutter. Write for bulletins on wide range of hydraulic and hand-operated machines. Also, let our engineers help you with tooling and special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.



No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M.... 42" x 12" table.



No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.

No. 1-14DS
Double Spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.

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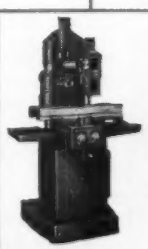
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head counter-balance.



No. 1-V
Hydraulic vertical head feed... 5½" head travel . . . 25" x 9" table.

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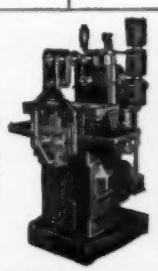

No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

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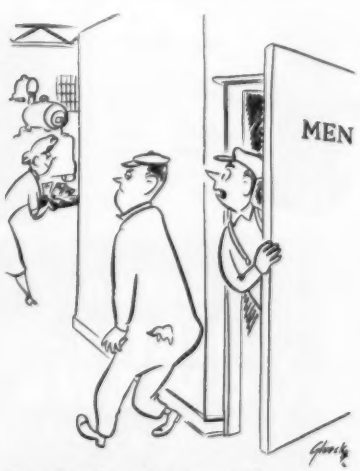
I WOULDN'T CALL any foreman backward because he can't run all the machines in his department. It would be quite expensive to educate foremen so they would fit exactly in each shop. Of course, it depends on what kind of a department it is. If a foreman has charge of a department with a specialized production, it should be easy to pick up the way to run any of the machines used. But if a foreman is hired to run a toolroom, nobody would expect him to be an expert on all the machines used there. It takes years to become either an expert lathe hand, milling machine operator, or bench hand in any tool shop. On the other hand, I cannot accept a man as a good foreman if he is unfamiliar with all the machines he has charge of.

Some people say that the principal merit of any executive is that he be a good organizer. Just as though good tools could be made anywhere if only the foreman is an expert in handling materials and signing paper forms! For my part I don't believe good tools are turned out in any toolroom unless the foreman is an expert in some of the trades included in making tools. (There are several.) I prefer foremen in tool departments who are expert bench hands, and have some experience on machine work, but need not necessarily be expert machine operators. Besides they must be good psychologists and able to handle men, choose their helpers, and have good character.

I wonder what good it could be to any company to hire Gibson as a foreman in experimental machining if he doesn't know a miller from a lathe? I figure Al is kidding, or else the management is no good. Gibson is perhaps the relative of some high brass, otherwise I don't think he could get a job of that kind unless



"Psst! Sunshine collection over?"

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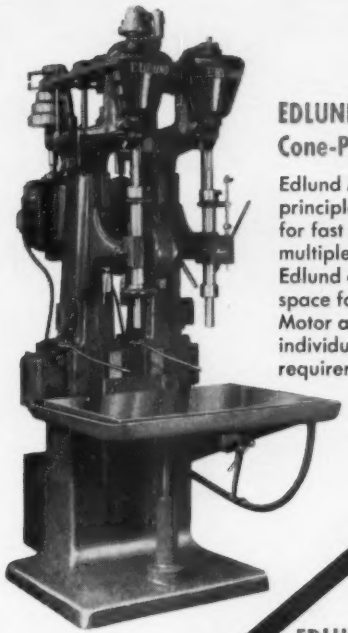
Applied Experience To Save You Money

EDLUND Drilling and Tapping Machines

Modern design — customer shop proved for increased production . . . longer tool life . . . greater accuracy . . . faster work handling.



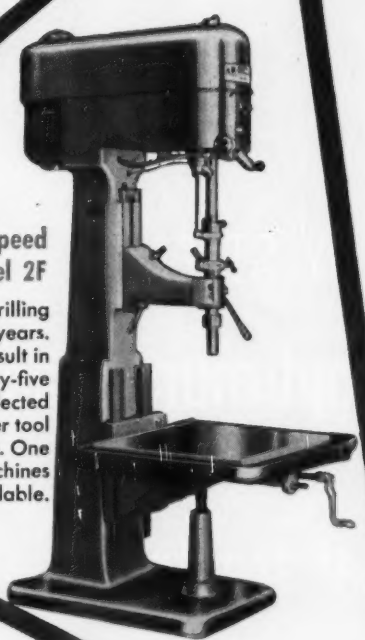
EDLUND Vertical Motor Cone-Pulley Drive—Model B

Edlund Model B machines incorporate the best principles of design and rugged construction for fast production at low cost. Single and multiple spindle machines. Practical Edlund attachments. Ample table space for efficient work handling. Motor and spindle speeds for your individual operating requirements.

The complete line of EDLUND machines and years of practical engineering experience offer a solution to even the most complex drilling and tapping problems.

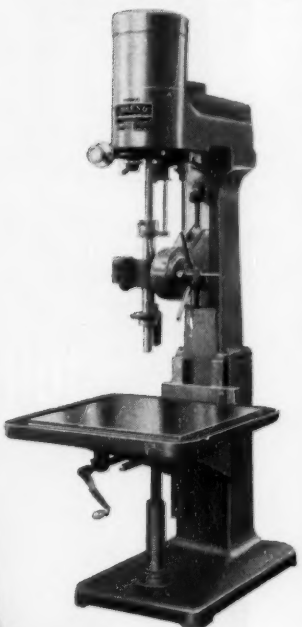
EDLUND Motor Spindle Model MS

A motor spindle high speed drilling machine with the rigidity essential to accuracy and long life. Built for general production and tool room service. All running parts ball bearing mounted and of rugged Edlund construction. Made in single and multiple spindle machines. Motors coupled directly to spindles meet demand for no-belt drive machines.



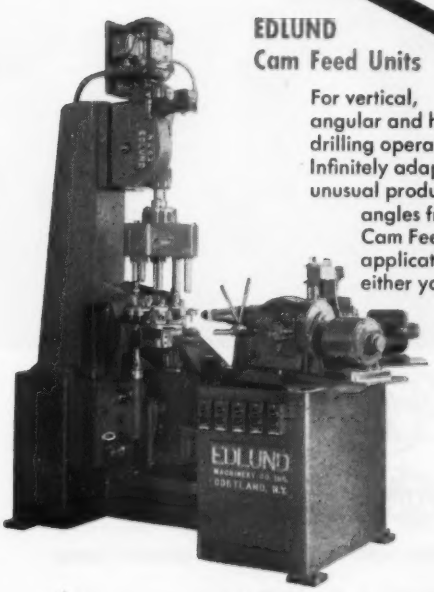
EDLUND Variable Speed Model 2F

The greatest advance in drilling machines in the past 25 years. Infinitely variable speeds result in production increases of twenty-five percent and more. Speed changes selected instantly without stopping. Longer tool life and increased production. One to eight spindle machines available.



EDLUND Cam Feed Units

For vertical, angular and horizontal drilling operations. Infinitely adaptable to meet unusual production problems and drill at angles from main machine operations. Cam Feed Units step up production, cut costs and applications are limited only by the ingenuity of either your or our engineers.



For detailed specifications on the EDLUND Line of Drilling and Tapping machines write for Edlund Bulletin G 53

Dealer Representation in Major Cities

EDLUND MACHINERY COMPANY
Cortland, New York

Affiliated with Precision Castings Co., Inc. Division Bradley Edlund Corp.

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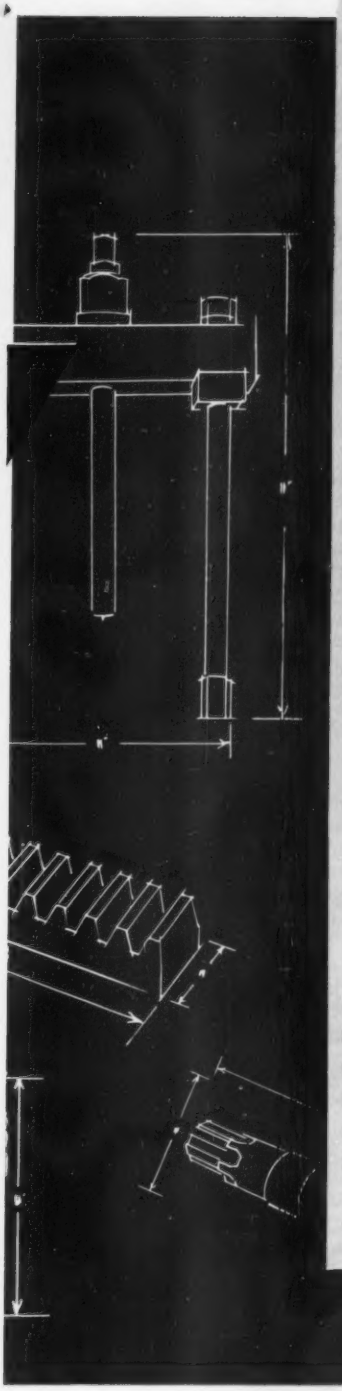


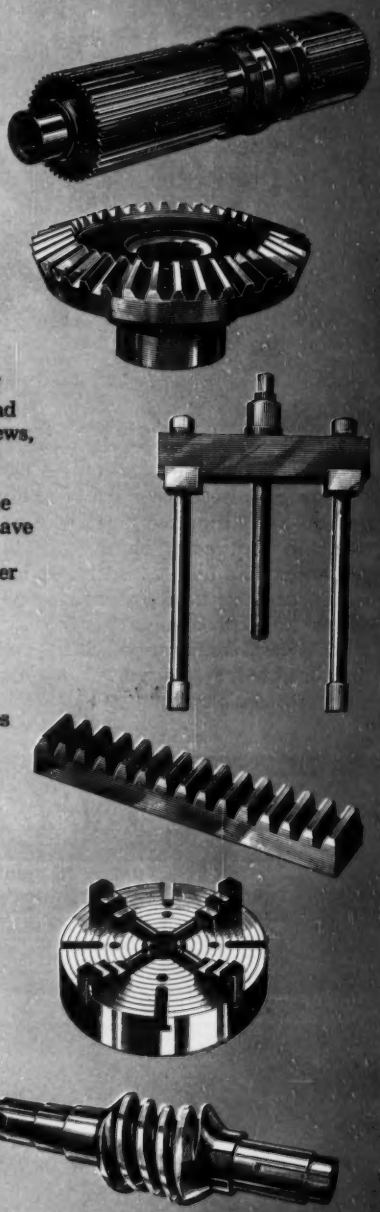
Here's an alloy steel that's a growing favorite of production men in metalworking — MAX-EL. It was developed by Crucible especially to provide a tough, high strength alloy that would be easier to machine after full heat treatment.

What's more, because of Crucible's unique mill set-up, MAX-EL sections are more accurate... bars are straighter — further plus values for the economy-minded production man. And MAX-EL comes in a complete range of sizes and shapes to meet your every need.

MAX-EL has reduced production costs and improved product performance in hundreds of applications such as machine tool spindles and gears, turbine shafts, lathe chuck jaws and screws, thread cutting and die head parts, ditch digger teeth, speed reducer gears and pinions, and truck axles. For MAX-EL is made in Crucible specialty mills where tool and other fine steels have been produced for more than 50 years... where quality is persistently controlled to a far greater degree than in ordinary steelmaking practice.

Then too, you can count on prompt, dependable delivery of MAX-EL regardless of the size of your order. Our special jobbing mill can turn out even 500 pound orders quickly and efficiently. And Crucible warehouses in key cities throughout the country carry stocks of MAX-EL so that in many cases you can get 24-hour delivery direct from a local source.

Crucible also makes a complete line of AISI and SAE alloy steels. So whatever your alloy steel requirements, be sure you *call Crucible.*



MAX-EL ADVANTAGES:

* *better machinability*
* *more accurate sections*
* *straighter bars*
* *full range of sizes*
* *prompt delivery — in pounds or tons*

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **ALLOY STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

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Per Day... Per Die... Per Dollar!

with . . .

Startling production results — and savings — are guaranteed by B. Jahn dies because each is engineered with ingenuity and craftsmanship that pays off throughout prolonged die life . . . designed for *performance and performance alone* . . . "production proved" to work — and keep on working — in the customer's equipment to his complete satisfaction.

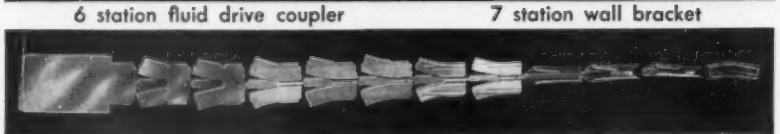
PRODUCTION B. Jahn PROVED

DIES

11 station toe plate for ice skate

6 station fluid drive coupler

7 station wall bracket



11 station 30 round carbine magazine

8 station parachute buckle

9 station car cigarette lighter part

ACTUAL CASE HISTORIES DEMONSTRATE HOW B. JAHN DIES BREAK PRODUCTION RECORDS . . . DELIVER MORE PARTS PER DAY, PER DIE, PER DOLLAR!

Send today for the fact-packed, picture story of "B. Jahn Production Proved Dies."

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

he had some experience on the kind of work he is to lead.

If Gibson has brains enough to pick up toolroom work in a hurry, it seems to me that he should have done that before he was appointed to foreman. Granted that Gibson is a good man of foreman caliber, why wasn't he appointed foreman at a place where they manufactured things he had experience on? How can he tell his men how to go about a job if he has no knowledge himself about it? This, it seems to me, is enough to prove that he is unsuitable as a foreman in this case.

Even if it is true that common sense and an open mind sometimes are good assets, it cannot be more important than the experience necessary to do the work in hand. Why not put it this way: a man with good common sense and large experience on the kind of work he is to administer is the man to pick for a foreman. Experimental work requires just as much experience as regular work, so I would eliminate Gibson if I had to appoint a foreman for this department or in the toolroom.

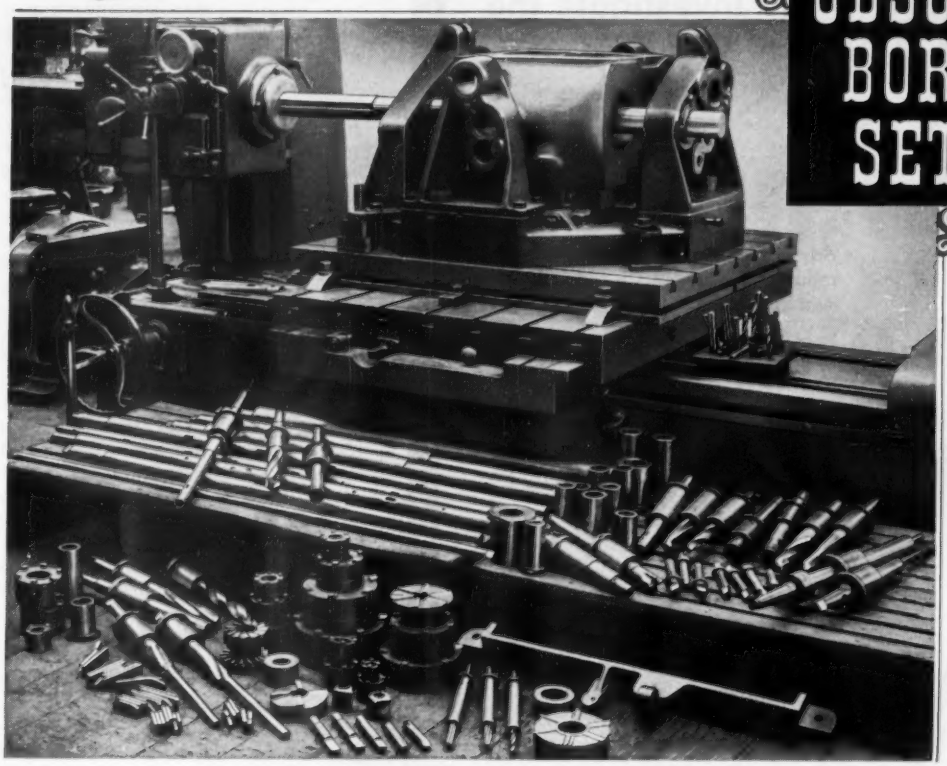
If Harrison, as superintendent, takes a chance on Gibson getting embarrassed in front of his men, he is not much of a superintendent. If I were in Harrison's place I would step in and help him if I had appointed him to lead the work in experimental machining. If he had been appointed by some higher-ups I would let him butt up against his difficulties until he left of his own accord.

I think any foreman can maintain discipline and respect if he is able to run some of the machines used, practice fair play, and have a broad mind. He should know something about everything and everything about something in his department. If he doesn't practice that slogan he'll be

"I'm taking you out to the El Ritzo tonight, honey. Today I made my first million!"

Here is a picture of an...

OBSOLETE BORING SETUP!

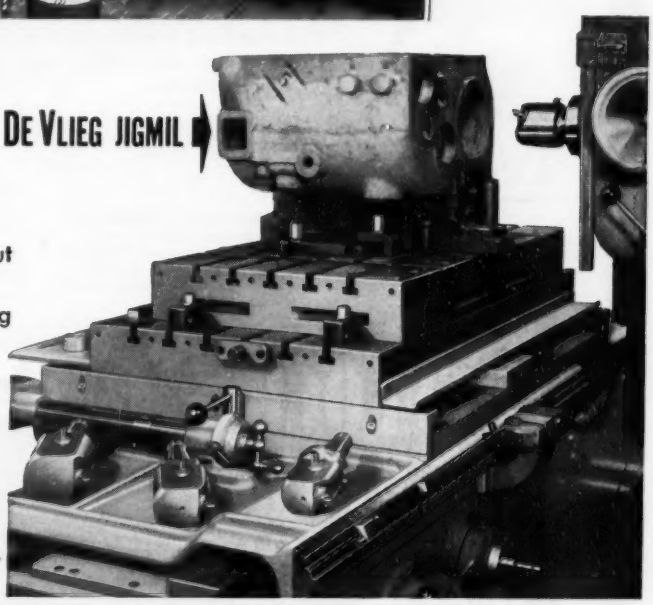


THIS PICTURE— taken in a well known machine tool plant illustrates the old method of boring turret lathe headstocks with a costly inflexible box jig and a mass of special tooling

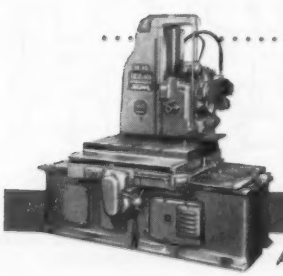
The Modern Method

"JIGLESS BORING" THE SAME PIECE ON A DE VLIEG JIGMIL

- Eliminated expensive boring jig
- Reduced machining time
- Improved accuracy with a resultant cut in assembly costs
- Permitted the use of simplified tooling



If your shop is burdened with costly boring jigs and special tooling, it will pay you to investigate the DE VLIEG SPIRAMATIC JIGMIL!



Come to Detroit... see a practical demonstration of the JIGMIL Technique . . .

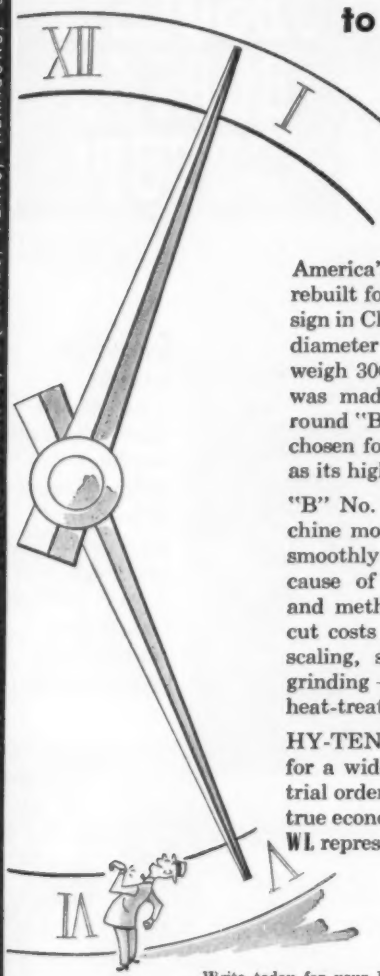
DE VLIEG MACHINE CO. • [illegible] • Detroit 20, Michigan

A request on your company letterhead will bring a copy of our comprehensive Illustrated Catalog

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

it's the right time

to Investigate the Qualities of HY-TEN ALLOY STEEL



America's largest clock was recently rebuilt for a spectacular illuminated sign in Chicago. It measures 50 ft. in diameter — hands and movement weigh 3000 lbs. The new driveshaft was made from 6 ft. of 3½-inch round "B" No. 3X heat-treated bar, chosen for its machinability as well as its high physical properties.

"B" No. 3X heat-treated bars machine more readily and finish more smoothly than standard alloys because of their particular analysis and method of manufacture. They cut costs by eliminating distortion, scaling, straightening — and often grinding — as well as the cost of heat-treating finished parts.

HY-TEN "B" No. 3X bars are used for a wide range of applications. A trial order will convince you of their true economy. Just call your nearest WL representative.

Write today for your FREE COPIES of Wheelock, Lovejoy Data Sheets, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

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jack of all trades but master of none. A foreman's ability cannot be foregone if he is merely hot on ingenuity and drive. In the long run, hot air can never take the place of know-how, even if a man temporarily can bluff himself through by using the whip.

Where to draw the line between an ordinary foreman and a special leader is difficult to state, but a common foreman in mixed production or toolmaking must be an expert in some of the trades he is to have charge of, and he must know when to use the whip and when to use the carrot, treat his men fairly, and morally be an example for his crew. A foreman should also be able to control his temper. I have seen leaders lose their temper for the least little thing and thereby create an atmosphere very detrimental to the working force and the company. Once a fellow came to me and said that his foreman was crazy and that he ought to be sent to some hospital. If a foreman strains his nerves too far he might collapse, and the crew will lose all respect for him, much more than if he cannot run all the machines in his sphere.

A special leader (not a tradesman), on the other hand, might be anyone who can use the whip only and be engaged on simple jobs requiring no brains at all, such as moving a heap of dirt from one place to another. Special jobs that require skill of any kind must of necessity be placed under the first category. A young man of foreman caliber should not be placed in charge of difficult jobs, but be told to acquire the skill necessary to hold a foreman's job. An older man who has not qualified himself during his earlier years as competent in some trade should never be appointed even as a special leader.

A E Fristedt
Stockholm-Bromma, Sweden

"Check the wiring in the shipping department. You'll need a fire extinguisher."

ANNOUNCING

A NEW

DUMORE® Super-10

Precision Handgrinder

VOLTAGE — 115 AC-DC
CURRENT — 1.4 amps
HORSEPOWER — 1/10
SPEED, no load — 22,000 rpm
DUTY CYCLE — continuous
BEARINGS — ball

WINDING CONNECTION — series
VENTILATION — internal fan
TEMPERATURE RISE — 40° C
FINISH — grey
WEIGHT — 3 lbs., 1 oz. with cord
2 lbs., 10 oz. without cord
LENGTH — incl. chuck 10-1/4″
SMALL DIA. — 1-5/16″
BODY DIA. — 2-7/16″

Here's new speed and better balance for full-shift precision tool and die work

NOW . . . get greater accuracy through better balance with this completely redesigned and improved version of the popular Dumore Series 10 Handgrinder. *Powered by a 1/10 hp continuous-duty-rated Dumore Universal motor,* the Super-10 assures greater precision with less fatigue . . . provides perfect balance for close tolerance control on fine work. For use with vitrified wheels up to 1″ in diameter, the Super-10 is available in three chuck sizes — choose from a 1/8″ or 1/4″ collet chuck, or a No. 0 Jacobs chuck, 0 to 1/8″ capacity.

For complete information, see your Industrial Distributor, or write —

"WATCH FOR ANOTHER IMPORTANT ANNOUNCEMENT NEXT MONTH!"

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1300 Seventeenth Street • Racine, Wisconsin

Builders of a precision line of Grinders, Automatic Drill Heads, Tool Post Grinders, Drill Grinders, Light Drilling Equipment, Flexible Shaft Tools, Handgrinders, Fractional hp Motors and Gear Motors.

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...the preferred

Ames Long Range Dial Indicator No. 262

... not because they cost more (in the long run they're more economical) but because they're completely *impersonal*. They do their measuring jobs absolutely independent of the human hand.

For more than 50 years, Ames Micrometer Dial Gauges and Indicators have kept pace with increasingly critical precision requirements. Today, each part of every Ames product is carefully built by exclusive Ames methods and machines from the materials best suited to its function — and 100% checked for accuracy. As a result, all Ames products are extremely accurate and sensitive, yet rugged and tough — to give you *longer* service with *less* down-time.

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MEDDLIN' MANAGERS

What's the best way to handle the executive who delights in puttering around the shop, particularly during a heavy-schedule run? Is patient attention the answer or will tactful hints do the trick?

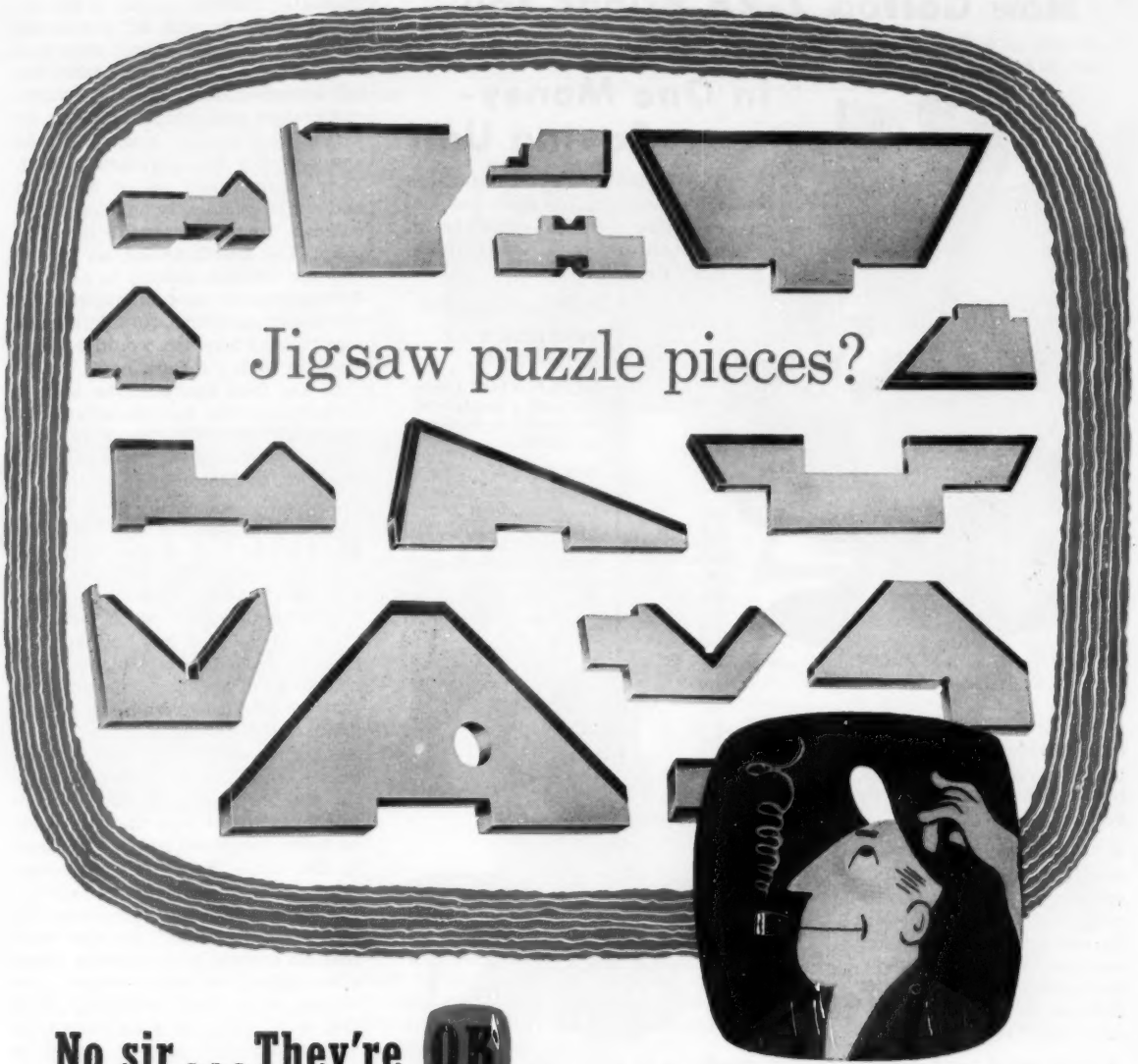
IF A HIGH EXECUTIVE, not actually employed in the shops, feels that he has a useful contribution to make in the matter of rapid and economical shop production, he should be welcomed by the shop foreman with open arms. If, in time, he proves to the satisfaction of all concerned that he can and does make such a contribution he should be given a hug of ecstasy. What's wrong with the boss wanting to muscle in on shop organization and production? Al must surely be losing his sense of proportion or his sense of humor. The most satisfying of all the arts is that of making a virtue of necessity. So long as the boss does not seek to kick Al in the pants for any of the misfires, Al should give him all the encouragement, even advice, of which he is capable.

Suggestion boxes are now a popular feature in modern industry; their appeal is to *all* employees, and that includes the boss. The suggestion box, of course, is intended for all shy inventors who want privacy and secrecy concerning their ideas, and all who make use of that convenience expect or hope to profit financially from any successes they may bring off.

The boss, of course is in a different category; he is not looking for direct financial reward and would probably be more pleased with a little publicity in the matter, rather than secrecy. Broadly, there are four choices for Al in his dilemma:

1. He can ignore the boss's activities and enthusiasms for shop affairs.
2. He can take a benevolent interest in them.
3. He can encourage them.
4. He can oppose and discourage them.

If he takes the first choice and decides to ignore them, he will probably regret the decision. Continuation of a negative attitude by Al would not escape the notice of the boss and might lead to unpleasantness between them. The result would do no good to either; it might even have the effect, in time, of causing Al to feel "out of it," cut off from the boss, isolated, lonely. If he takes the second course, the results might be no happier; it is always difficult to remain benevolent without becoming lukewarm. Lukewarmness, in the eyes of en-



No sir . . . They're OK hardened bedway cross sections!

These hardened ways, made by The Ohio Knife Co., give you an idea of the diversified shapes and sizes supplied. OK's special process of manufacture permits building to your specifications in a wide range of design.

Specially heat-treated tool steel makes OK ways practically wear-proof and helps maintain constant accuracy throughout the life of the machine. This extreme hardness, 65-66 Rockwell "C," is uniform to 3/16-inch depth or more.

Through the Ohio Knife process the long-wearing tool steel is welded to a soft steel backing under 2500 tons pressure. Then precision equipment finishes the bedway by grinding to tolerances up to ± .0002 inches.

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

Write today to Dept. W for comprehensive bulletin, or send us your bedway specifications.

Manufacturers for the metalworking industry of:

SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS
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HARDENED WAYS • BALL RACES
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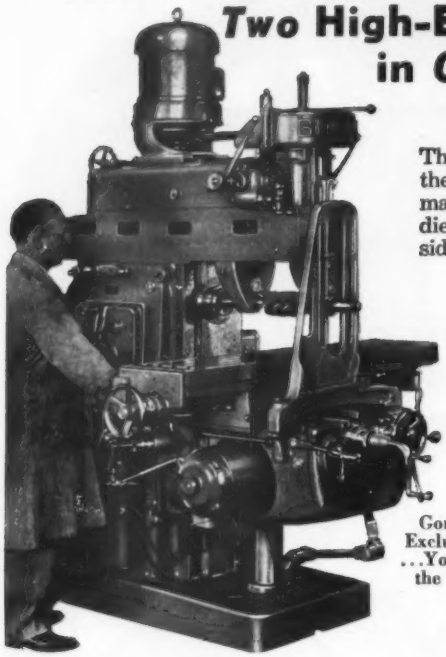
New Gorton 2-28 Brings You *Two* High-Efficiency Mills in *One* Money-Saving Unit



. . . as a horizontal mill.

The Gorton Receptor Ram makes the new 2-28 a true multi-purpose machine . . . "tailor-made" for *all* die-mold-machine shops. Consider the facts:

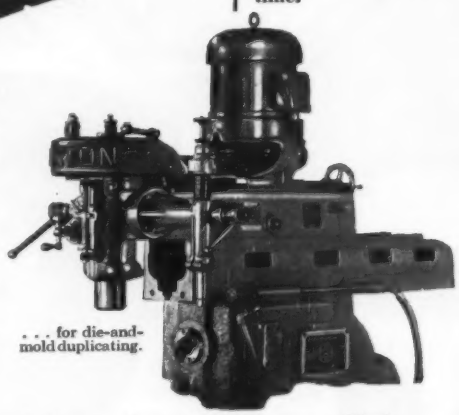
HORIZONTAL MILL

VERTICAL MILL (Super-speed)

DUPLICATOR (Simply add a duplicator head and a duplicator table.)

NOTE: You can switch from horizontal to vertical high-speed milling in 5 minutes or less. Save space and capital equipment — and increase production facilities at the same time.

Gorton Exclusives . . . Yours in the 2-28



. . . for die-and-mold duplicating.

- Fullwidth knee, 24½ inches wide, provides extreme rigidity. Even under heavy cutting loads, there's no sag or twist.
- New lubrication system dissipates heat to prevent spindle "growth" . . . to promote full use of spindle horsepower . . . to end the necessity for adjusting cutter depth to compensate for differences between "hot" and "cold" operation.
- High-speed head delivers spindle speeds up to 4000 rpm. Horizontal spindle: up to 2000 rpm — 7½, 10 or 10/5 hp *at spindle nose.*
- Double-extension feature of the Receptor Ram greatly increases work area, vertical capacity and transverse cutting capacity on either the Gorton 2-28 or 3-34 Horizontals.
- Down time and maintenance are drastically reduced by *true* unit construction features. A removable coolant pan speeds sump cleaning and coolant changing.
- Overload protection automatically safeguards expensive cutters. A horsepower-load meter constantly indicates cutter condition and operating efficiency.
- Full directional front and rear controls are interlocked.

You can't afford to overlook this Gorton Horizontal with Receptor Ram. It could produce more profit per dollar invested than any other machine you have. Fill out and mail the coupon.

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Please send at once Bulletin 1655-1502 and data on Gorton Horizontals.

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A 7788-⅔

thusiastic, forceful leaders is the unpardonable sin, and all executives who wish to succeed should shun it as they would a plague. If he takes the third course, offering whole-hearted cooperation and encouragement, he will, at least, earn the boss's gratitude and probably his increased respect. That result would do Al no harm and might confidently be expected to enhance his prospects with the company. The fourth choice, ie, to discourage the boss and try to curb his enthusiasms for shop management is the disastrous course. No sensible and experienced foreman would break a lance in such a forlorn hope.

In the final analysis, the boss is held responsible for the whole box of tricks. He is an important employee of the company and any subordinate who attempts to bog him down is batting on a sticky wicket. The ancient philosophy of chasing the manager out of the shops has few admirers today, and any foreman who feels that this is part of his job has sadly mistaken his vocation.

Can Al make a few pointed suggestions in a safe direction, or should he simmer down, considering the fact that his boss has a right to get his hands dirty once in a while? There are many suggestions that Al can make, but he should steer clear of the pointed variety if they are apt to convey to the boss that he would be better employed in his office than in the shops. From Al's statement "Burnside allowed me to run my department without interrupting my men every so often," we may infer that his present boss, Johnson, keeps interrupting the men without consulting, or at least notifying Al. If this is so, there is good reason for Al's resentment, and he would be well within his rights were he to suggest to his boss that direct dealing with the men tends to weaken his—the foreman's—hand and makes more difficult an already difficult executive job.

In his own interests, if for no other reason, the manager should do all in his power to free the foreman's mind from all such distracting worries. Only thus can the foreman approach

"Hello, Morning Bugle? Cancel our ad—wait, never mind."

Simplified Valving and Electrical Controls

All valves are mounted on a single manifold to simplify piping and maintenance—as J.I.C. suggests. Electrical controls also meet J.I.C. recommendations.

Floor Space Saved

By mounting the power unit and reservoir at the top of press, valuable floor space was saved...yet the entire unit is readily accessible for maintenance.

Hannifin press

Solves Customer's Problem

Stroke.....24″
Daylight.....40″
Table Width.....60″
(between columns)
Table Depth.....48″
Approach....67″/min.
Feed.....11″/min.
Return.....114″/min.

Versatile, Movable Operating Controls

Exclusive Hannifin Sensitive Pressure Control for hand or foot operation—so arranged that the operating levers can be positioned anywhere along front of press, depending upon nature of work.

Basically this is a standard 150-ton, 4-column Straightening Press...yet it is an example of modifications available at Hannifin to meet customer needs.

For example: Because his floor space was limited, the hydraulic power unit is mounted on top of the press. The table top is "tailored" to the 24-inch height of other units in his production line. The control levers, for hand or foot operation, are movable across the entire front of the press. Both hydraulic and electrical specifications meet J. I. C. recommendations.

Quite probably you can select the hydraulic press you need directly from the complete Hannifin Catalog that includes more than 75 standard models in 1 to 150-ton capacities...but, if your requirements are special, a Hannifin Field Engineer will help you specify a press that will exactly solve your problem.

Hannifin Corporation, 1117 South Kilbourn Avenue, Chicago 24, Illinois

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HANNIFIN CORPORATION
1117 S. Kilbourn Ave., Chicago 24, Illinois
Please send Bulletin 130 on Hannifin Hydraulic Presses.

Name.....

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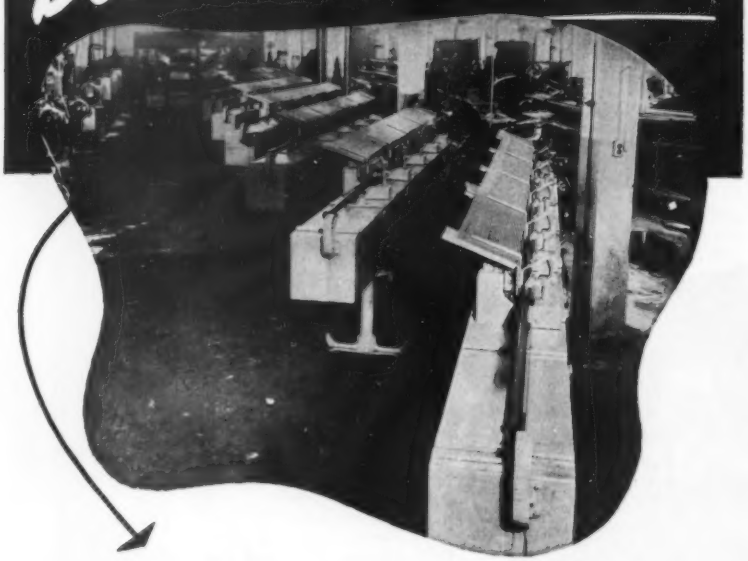
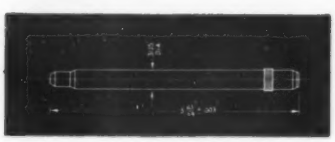
LIPE AUTOMATIC MAGAZINE LOADING BAR FEEDS *Doubled* PRODUCTION!

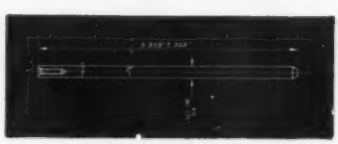


The machined worm wheel shaft and agitator rod shown below are typical of the many parts turned out on a bank of seven screw machines equipped with Lipe AML Bar Feeds at Hamilton Beach Division, Scovill Mfg. Co., Racine, Wis., manufacturers of food mixers, vacuum cleaners, hair dryers and other motorized appliances.

No lost time in loading and hand feeding! . . . No scratching of high-finish stock! . . . No idle operation of screw machines! . . . Maximum production capacity fully maintained!



Long worm wheel shaft .3125" dia. machined from piston rod finish, cold-drawn steel. When the Lipe AML Bar Feed automatically loaded and fed the stock to a Model 2G B&S, *production increased 100%* over conventional loading operation.



Agitator rod .250" dia. machined from S.A.E. #1112 Bessemer wire. When the Lipe AML Bar Feed automatically loaded and fed the stock to a Model 00G B&S, *production increased 100%* over conventional loading operation.

On job after job there is proof—like these examples from a typical four-week production run—that Lipe Automatic Bar Feeds insure big production gains, BECAUSE:

- Stock is fed to screw machines all the time . . . not dependent on operator.
- Pressure constantly behind stock.
- Eliminates feed fingers.
- Avoids multiple feed finger feedouts.
- Model AML gives maximum output of machine . . . no "cutting air."
- Saves changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem . . . no obligation.

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Manufacturers of Automotive Clutches and Machine Tools
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his task with the zeal and enthusiasm which, being infectious, can spread to the men and which, alone, can achieve the results that automatically flow from good leadership and good team work.

Zeal and enthusiasm, if properly directed, are also excellent qualities in a manager, but they are more likely to hinder than help if improperly applied. The experienced manager with shop suggestions to offer will make them known, in advance, to the shop foreman. If he is really experienced—not merely clever and well educated—he will consult with the foreman as to how his suggestions will fit in with prevailing conditions and existing shop practice. The foreman may have comments to offer and the enthusiastic manager will do well to consider them impartially, before finally deciding that his own ideas constitute the last word. This is important; we are mostly all partial to our own children, be they of wedlock or of our brain. Should the foreman's observations not commend themselves to the manager, he is in a position to go ahead with his own plans and should instruct the foreman accordingly. In no circumstances should he, personally, initiate or supervise any shop enterprise to the exclusion of the shop foreman. In the first place that would be rude and, secondly, it would be bad business; it would amount to condemnation of team work and would be almost too bad to be true, an excellent example of management at its lowest.

No, Al should not simmer down if that means taking the line of least resistance. The experienced shop foreman with a reputation to uphold cannot afford to be indifferent to any phase of shop activity. At all times he should endeavor to be as helpful and cooperative as he can, no matter how unsuitable the manager's suggestions may, at first sight, seem, but he should, politely and firmly, insist on his position in the shop being recognised by all concerned. The proof of the pudding is in the eating and harebrain schemes usually fall short of their objective. Furthermore, it is a point for the foreman if the manager forces through a misfire against the advice of the shop foreman. On the other hand, if the manager's ideas are sound and prove fruitful, an accommodating and helpful Al will share the credit, so, the cooperative foreman stands to win whatever happens.

The fact that "the boss has a right to get his hands dirty once in a while" does not justify him by-passing the shop foreman in the process.

M Donald
Lanarkshire, Scotland

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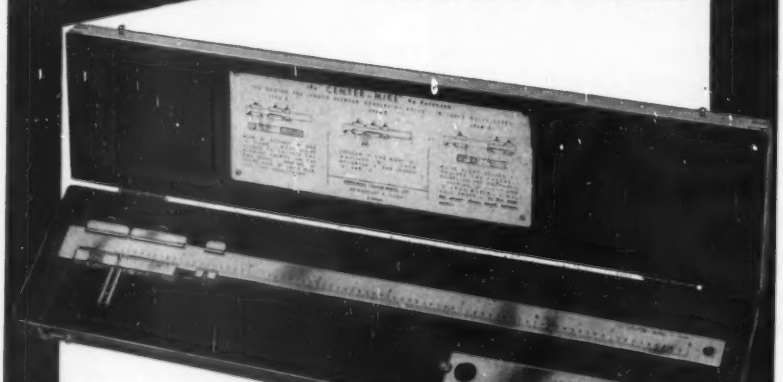

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NEW BOOKS

WORKSHOP COSTS AND COSTING—*By P S Houghton. Published by Chapman and Hall Ltd, 37 Essex St, WC2, London, England. 295 pages. Price 35s.*

A thorough analysis of cost procedures in shop operation in Britain, this book is based on the author's practical experience in a number of manufacturing concerns. The book discusses in detail such factors as division of indirect expenses, items encountered in a cost system, methods of setting wages, establishment of a cost system in a new business, methods of collecting data, codes, and contract and process costing.

A hurdle for the US reader will be the differences in terminology and in the tax and other regulatory procedures in the two countries. Within this limitation, the book is a useful explanation of the many factors involved in practical cost accounting.

THE NORTON STORY—*By Mildred McClary Tymeson. Published by Norton Co, Worcester, Mass. 312 pages.*

This industrial history, which tells the story of the development of a pottery shop in Worcester into the present Norton Co, is told largely in human terms. Mrs Tymeson has been fortunate in that many of the people associated with the early days of the company are still alive and were able to add their personal recollections to the results of her research in company archives.

Thus we learn of Swen Pulson's early efforts (1873) to make an emery wheel, how he saved the money from his $9 weekly paychecks to assemble the materials, of his initial failures, and ultimate partial success, how he sold his first two wheels (for $25) and after saving to buy the emery for them had disaster strike in the form of a torn paper bag that deposited his emery in the dust of Green St, how he scooped it up and carried it home in his pocket. Even so, the wheels cracked and Mr Norton, his patience exhausted, put an end to the experiments. Swen wandered on to other jobs, but kept drifting back and in 1876 Norton finally applied for a patent on his employee's emery wheel.

By 1881, *American Machinist* was saying, "Every complete machine shop should have at least one emery wheel if only for grinding tools."

Eventually the emery-wheel business was overshadowing the pottery and the aging Norton sold it to three

employees — Charles Allen, John Jeppson, and Walter Messer. They raised the necessary $10,000 from Milton Higgins and George Alden of the Washburn Shops of the Worcester Polytechnic Institute, and Fred Daniels and Horace Young of Washburn and Möen Mfg Co. Thus the new company was born and, "In retrospect it seems that Opportunity, dressed in the disguise of a grinding wheel, knocked many times at Frank Norton's door. When the door was finally opened, it also appears that Opportunity walked in and straight out again without making even more than a nodding acquaintance of Mr Norton."

It was in 1900 that the Norton cylindrical grinder was born, the work of Charles Norton (no relation to Frank). The original machine was sold to R Hoe and Co where it remained in use until 1928, is now on display at the Edison Institute in Dearborn.

Mrs Tymeson has managed, in her two years of research, to learn quite a bit about the grinding business so that her account of the developing technology, particularly as it relates to wheels, is wholly satisfactory. At the same time she has retained her basically non-technical approach so that she can describe the developing complexities of wheel selection with wide-eyed wonder. And she has apparently been given freedom to write an honest account in which the errors and mistakes of 68 years, as well as the successes, have their place.

She has achieved a book that will not only be of sentimental value to those connected with Norton, and a useful reference for historians, but one that can be read with interest by an outsider.

•

How To Be A Successful Leader — *By Auren Uris. Published by the McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 239 pages, 5½ x 8 in. Price, $3.50*

Opening pages of this book describe leadership in general, telling the three basic types of leadership—autocratic, democratic, and free-rein —and how each type is suited to a particular situation. The nature of the leader, the nature of the followers, and job conditions determine which type of leadership is most efficient.

As the book progresses, types of leadership are studied in detail, and suggestions are given to solve different leadership problems by adjusting the leadership method to suit circumstances, if the results sought from the organization are not forth-

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coming with present methods.

Finally, the book describes general organizational problems which can be solved by manipulation of leadership policies.

A number of self-analysis tests are given throughout the book, so the reader may discover hidden attitudes, the awareness of which may help him adjust his methods of administration to suit his personality, reducing the strain of performing his job.

In the past few years, a number of books on human relations have been written in what might be called the "inspirational," rather than analytical, style; this is not to say these books are without sound thought, but rather that the writing is in the terse, heavily punctuated, bulletin style consistent with modern theories of "readability." The book under consideration is so written.

•

FBI REGISTER OF BRITISH MANUFACTURERS *1954* (26TH EDITION) — *Published by Iliffe & Sons Ltd, Dorset House, Stamford St, London, SE 1, England, and Kelly's Directories Ltd, 186 Strand, London WC 2, England. 952 pages 9½x7½ in. Price 42 shillings.*

This standard export reference book to British industry has been prepared for the Federation of British Industries and forms a comprehensive and reliable source of information as to the manufacturers of British goods available for export. A buyer's guide classifies over 6500 FBI members under 5000 alphabetical trade headings and gives full details of the firms in an alphabetical directory.

Other sections give information about trade associations, proprietary names, trade marks, trade commissioners, chambers of commerce, commercial attaches, and reference libraries throughout the world. Introductory information and detailed instructions on the use of the register are given in English, French, and Spanish.

•

LEFAX MANUAL OF MATHEMATICS — *Published by Lefax Publishers, Philadelphia 7, Pa. 335 pages. Price, $2.25*

Newly revised pocket-size data book with tab-indexed sections on mathematical equations, long tables, natural trigometric functions, conversion tables, and other allied information. The mathematical reviews section contains over 200 equations, in the subjects of algebra, analytical geometry, trigonometry, and differential and integral calculus.

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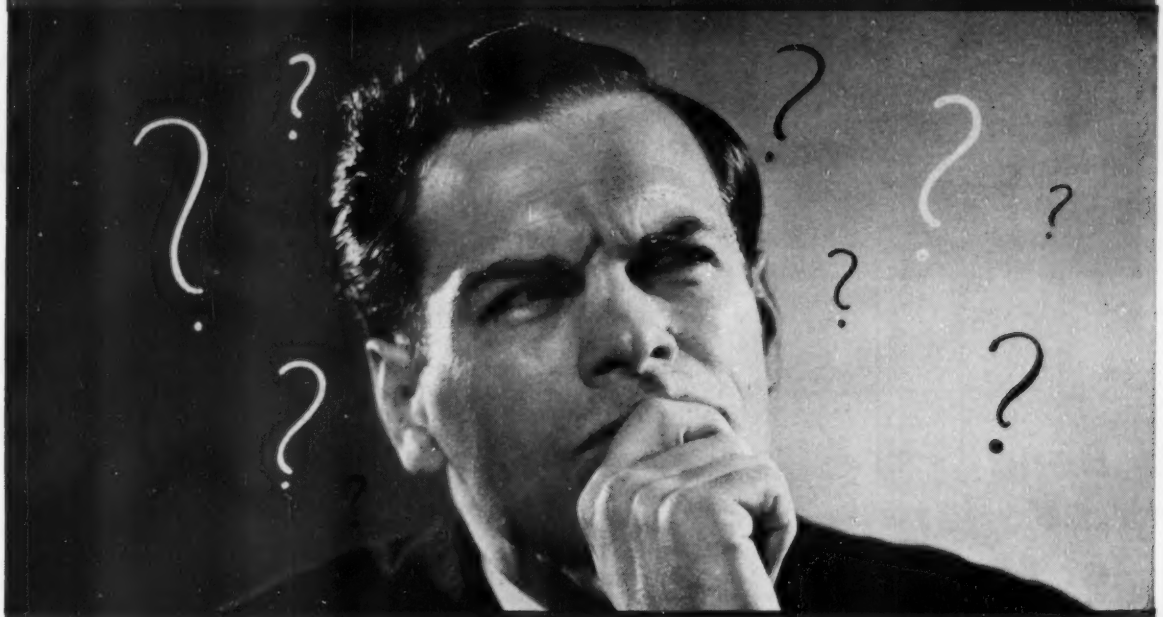

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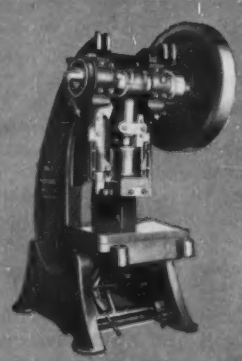

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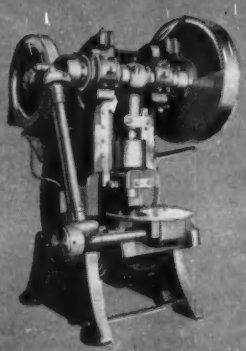

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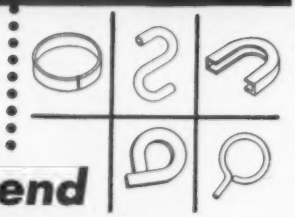

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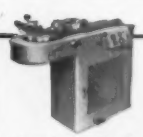

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Names in the News

Charles B Elledge

Gustave H Froelich

Charles B Elledge, manager of materials handling industries sales for General Electric Co, has been elected president of The Material Handling Institute, Inc. **Walter E Schirmer,** vice president of Clark Equipment Co, Buchanan, Mich, and **Edward W McCaul,** secretary, Jervis B Webb Co, Detroit, have been named first and second vice presidents. Mr Elledge succeeds **Howard M Palmer** of Lewis-Shepard Products, Watertown, Mass, who has been named a director of the association.

L L Garber, vice president, H K Porter Co, Pittsburgh, has been elected a director, vice president, and general manager of Alloy Metal Wire Co, Prospect Park, Pa, newly-acquired division of H K Porter. Mr Garber, formerly general manager of Porter's Hinderliter Tool Co Div, has been with the company for four years, serving in various management and production capacities.

Douglas R Starrett, assistant vice president, L S Starrett Co, Athol, Mass, has been appointed vice president in charge of plant operations. **Carl O Newton,** formerly eastern sales manager, has been named sales manager. **Donald E Gilbert,** New York branch manager, succeeds Mr Newton. **Roy M Peckham,** Atlanta representative, has been appointed southern sales manager.

C R Burrell, vice president, sales Tool Steel Gear & Pinion Co, Cincinnati, Ohio, has been appointed director of the General Components Div, Business and Defense Services Administration, US Dept of Commerce, Washington, DC. The division has responsibility for gears, valves, fasteners, chains, bearings, and related industries.

Gustave H Froelich, vice president of the Torrington Manufacturing Co, Torrington, Conn, has been appointed to the new post of general manager of the company's Machine Div. He joined the firm in 1943 as superintendent of the Air Impeller Div, and was made a vice president in 1946.

Leslie B Bellamy has been appointed general manager of Cleveland Quarries Co's Sterling Abrasives Div, Tiffin, Ohio.

Arch R Smith has been named vice president and general manager of the Grand Rapids branch of the Frank Colker Co, Detroit distributors for Towmotor Corp. Prior to his appointment Mr Smith was executive vice president and general sales manager for the Ready-Power Co, Detroit, which he joined in 1935.

James F Brinkerhoff has been named factory manager of Argus Cameras, Inc, Ann Arbor, Mich. Mr. Brinkerhoff joined the company in 1951 as assistant to the president; at the time of his promotion he was director of industrial relations.

Robert E Tanner has been elected vice president and general manager of Carver Pump Co, Muscatine, Iowa. He will also head sales operations. Mr Tanner was previously associated with Continental Can Co, and with National Can, where he served as vice president.

Austin Goodyear has been elected a vice president of Hewitt-Robins, Stamford, Conn. Mr Goodyear joined the firm in 1941; in 1952 he was appointed general manager of the rubber and conveyors divisions, and made a director of the company.

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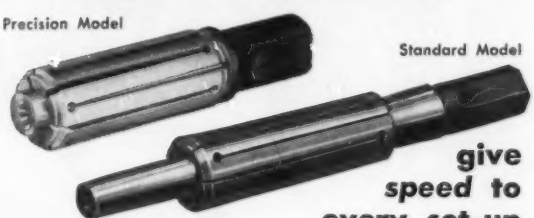

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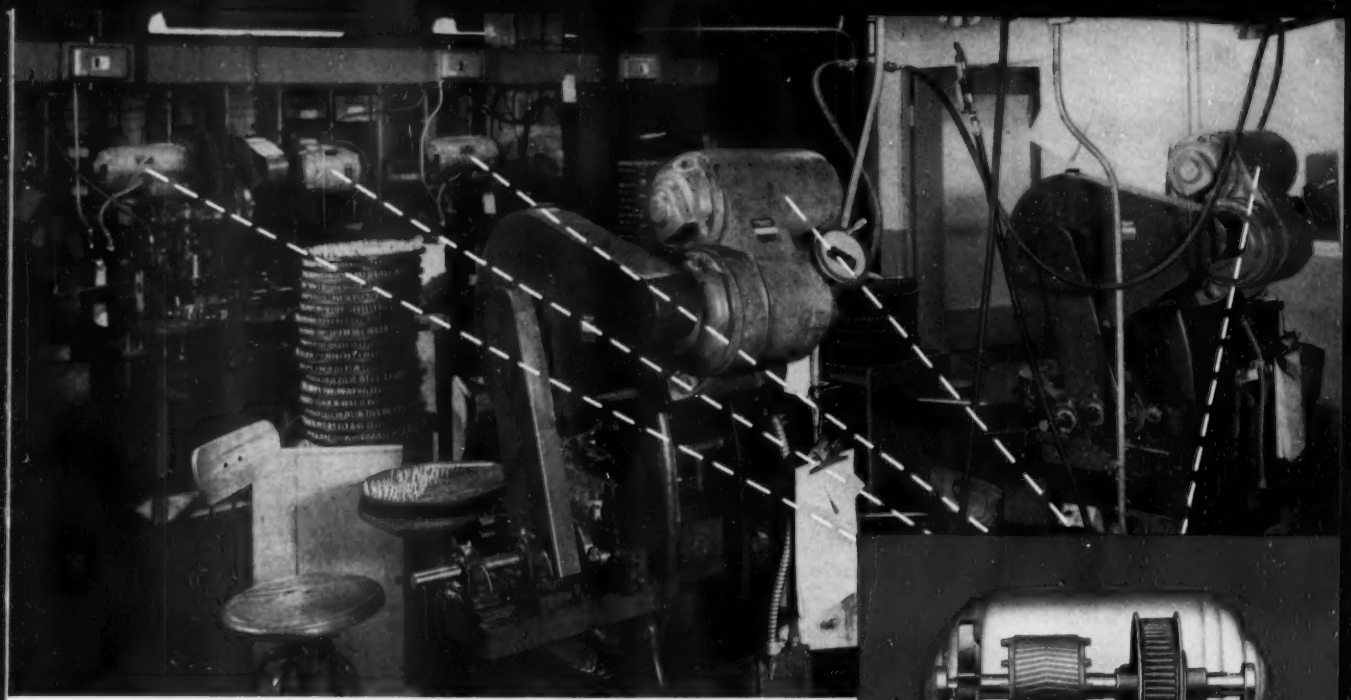

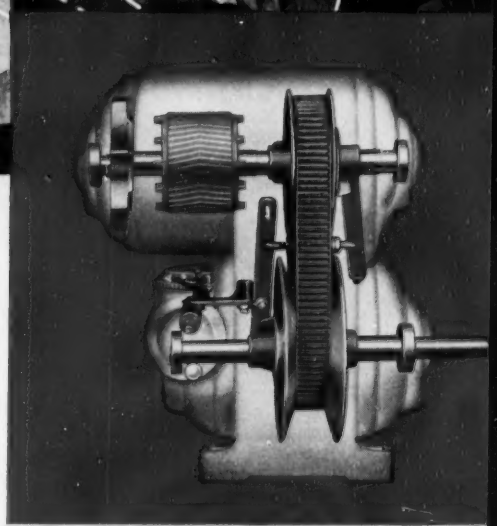

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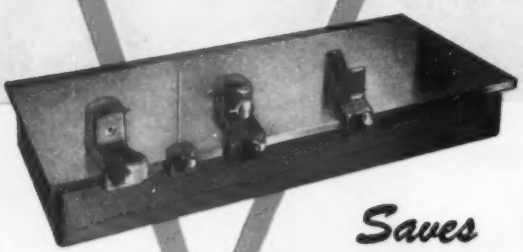

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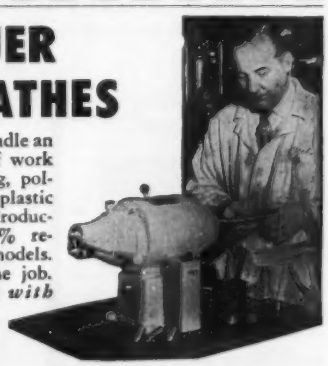


These versatile machines handle an almost *unlimited* variety of work —deburring, filing, lapping, polishing, etc.—on metal and plastic parts. Thousands in use. Production increases up to 158% reported! Many sizes and models. Holding devices to suit the job. *Speed your production with Schauer Speed Lathes.*

WRITE FOR BULLETIN 500

SCHAUER MANUFACTURING CORP. 4506 ALPINE AVENUE CINCINNATI 36, OHIO

Dudley J. Scholten, Vice President of Argus Cameras, explains why:

He doesn't believe in negatives!

When dealers phone for more stock fast—because customers want Argus cameras *now*— Dudley Scholten doesn't believe in negatives. He won't say "No." He uses Air Express.

"Last December 23, for example," he will tell you, "a large Indianapolis camera shop ran out of Model 75's, called us in Ann Arbor headquarters.

"We got together half a gross by noon of December 24 and let Air Express take over from there. That night, the dealer phoned again to say *'Thanks.'* The Air Express delivery had arrived early in the afternoon—and by closing time he had sold out the whole order!

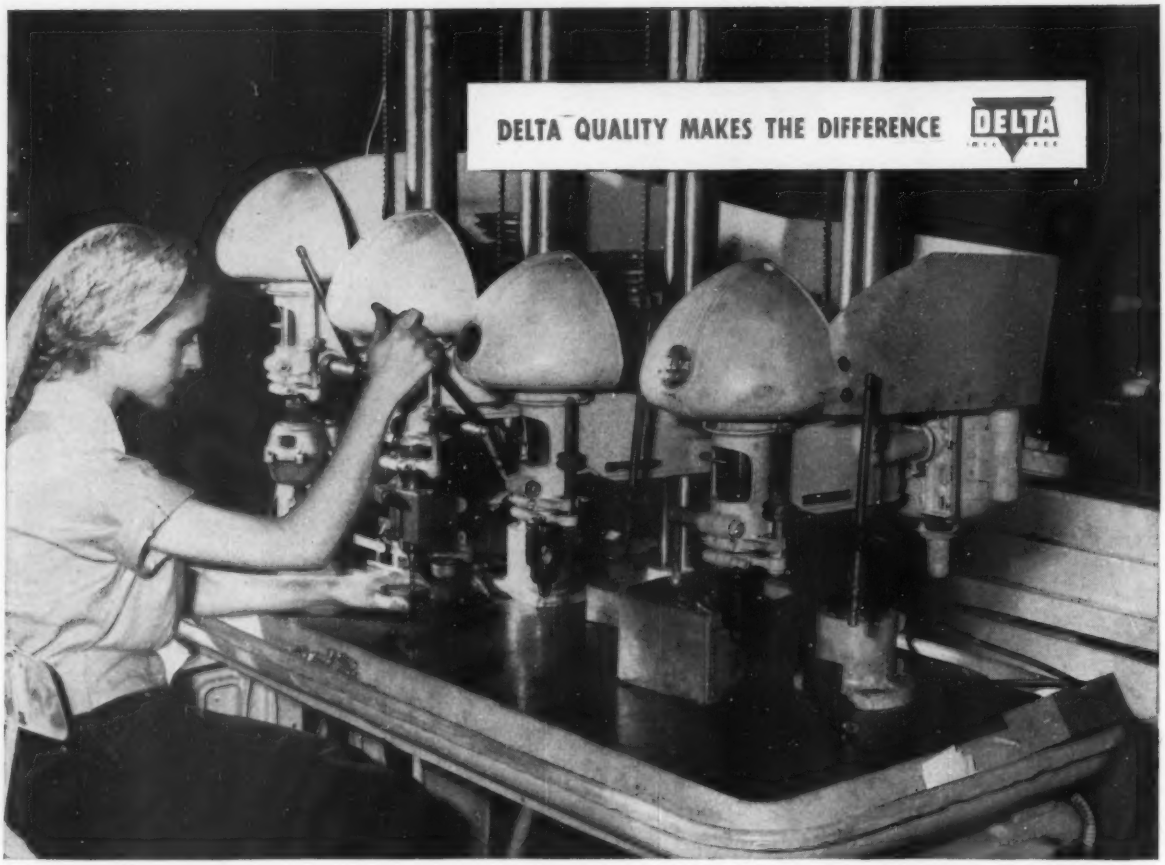
"There's no doubt that the astounding growth of Argus owes much to this policy of reliable, fast distribution. Argus sales rose from a net of some 5-million dollars at the end of 1950 to about 19-million in 1953.

"We ship by Air Express to our outlets all over the country in weights from 4 to 30 pounds, often as much as 120 pounds. Air Express always comes through for us, and we have found that most of our shipments cost us less than with any other air service."

It pays to express yourself clearly. Say Air Express! Division of Railway Express Agency.

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*



One Operator Plus One **DELTA** Set-Up

HOLLOW MILLS, DRILLS, TAPS AND COUNTERSINKS

AT SKILLMAN HARDWARE

More pieces per hour with less labor cost—that's what Skillman Hardware Manufacturing Co., Trenton, N. J., gets by locating inexpensive Delta tools in groups so that related machining operations can be done by a single operator.

Though Delta tools are inexpensive, they are production machine tools—as accurate as tools costing many times as much.

Here's the testimony of John Strasenburgh, Skillman production foreman: "Of course, since we build locks, our precision standards are very high, and we work as close as .0005", but our Delta tools are accurate, dependable and easy to operate."

These are some of the ways Skillman groups Delta tools:

- . . . two Delta drill presses side by side; one drills, the other taps.
- . . . three Delta drill presses together to drill, tap and counter sink.
- . . . four Delta drill presses—to hollow mill, drill, tap and counter sink.
- . . . two 17" Delta drill presses mounted on single column with opposing spindles drilling and reaming same hole in one set-up.

Light, mobile, dependable Delta tools are easily adapted to hundreds of production jobs. There's a wealth of such performance data available to you. Ask your Delta dealer—he's in your Classified Phone Book under "Tools," "Machinery" or write for Catalog AB52 to Delta Power Tool Division, Rockwell Manufacturing Co., 4000 N. Lexington Ave., Pittsburgh 8, Pa.

DELTA quality power tools

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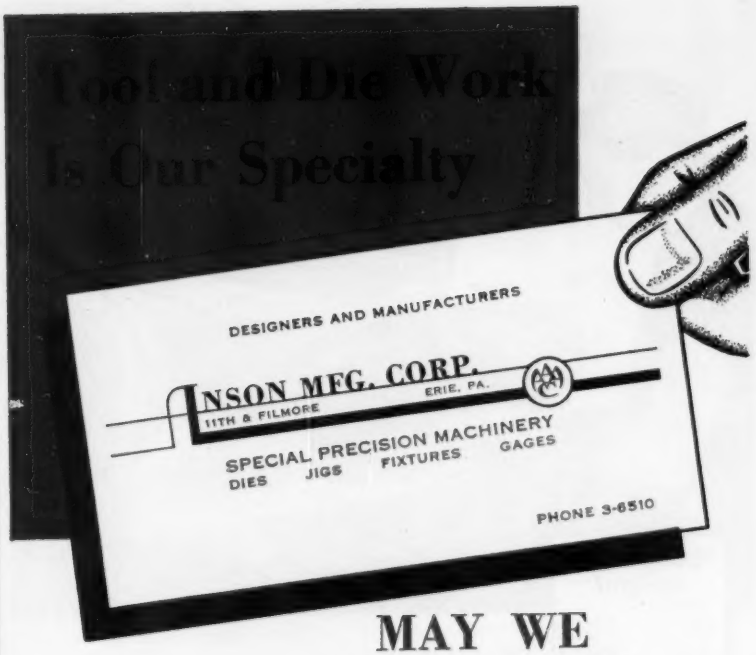

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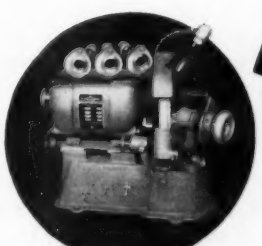

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- **Exclusive "positive-positioning" assures accuracy!**
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50% decreased grinding time, grinding costs way down, less operator fatigue, greater wheel life, increased production

Here's what the Tool Room Superintendent at the Tool Steel Gear and Pinion Co., Cincinnati, Ohio says:

"Since installation this Standard Tool Grinder has had no downtime . . . required no maintenance other than routine. We use the machine daily, sometimes continuously on production wet-grinding of carbide tipped hub-turning, offset turning, boring and other high-speed steel tools. It's by far the best precision grinder we've used."

Outstanding performance? No . . . just typical of the Standard Twin Wheel Tool Grinder. Available in 10" and 14" wheel sizes; wet or dry. No spray or splash when wet-grinding. Two operators can grind at once. Conserves floor space. Write for Bulletin TW today for full details.

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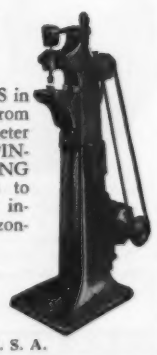

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Is Old, Tired Machinery and Equipment COSTING YOU MONEY?

If you have as much old and outmoded machinery in your shop as most metalworking plants have, your production efficiency is way below what it ought to be.

The new PRODUCTION PLANBOOK for Metalworking, which came to you in November as part of your regular *American Machinist* subscription, has the answers to questions like these:

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- How does *your* plant compare with the overall picture?
- Can *you* profit from modernization? Exactly when, and how? How have other companies done it?

The 1954 PLANBOOK, featuring a new *American Machinist* Inventory of Metalworking Production Equipment, is jam-packed with sound, usable, up-to-the-minute data on replacement and modernization of every type of machinery and equipment used in metalworking—*data available nowhere else.*

The PRODUCTION PLANBOOK for Metalworking

is published every November by

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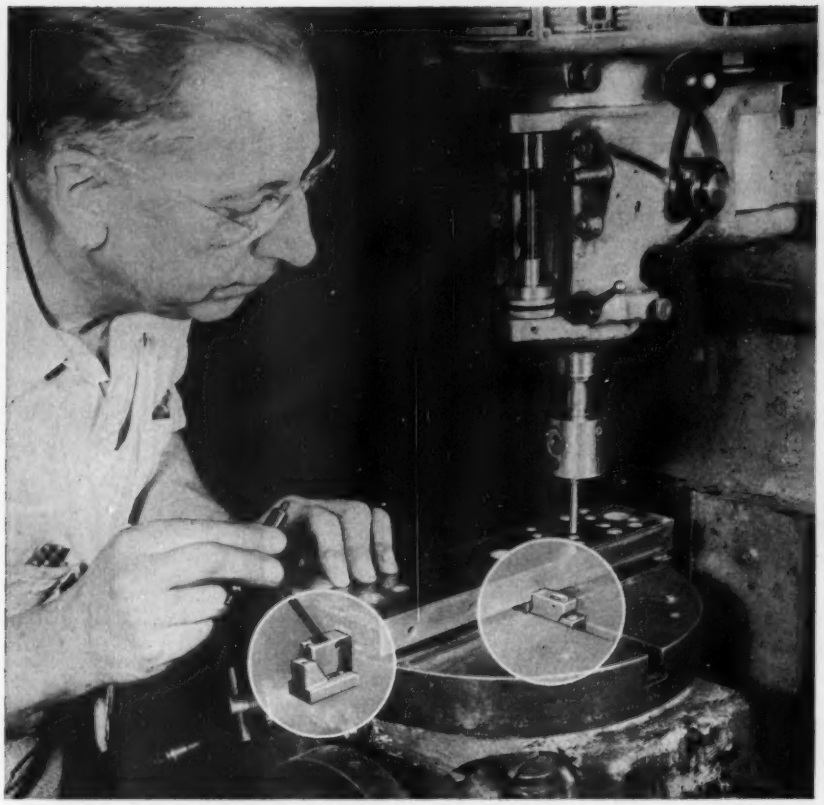


MOUNTING WORKPIECES ON ROTARY TABLES WITH TEE-SLOTS UP TO 1" IS A SIMPLE JOB WITH NEW J & S DOWNHOLDING TEE-SLOT CLAMPS.

Here's a quicker, easier way of securing workpieces to rotary tables!

New J & S Tee-Slot Clamps eliminate straps—keep entire work surface free—cut handling time up to 75%

Up to now, loading and unloading workpieces on a rotary table has been an awkward, time-consuming job. New J & S downholding Tee-Slot Clamps make the job easier, save as much as 75% of the time usually required with old methods.

Other Advantages

J & S Tee-Slot Clamps avoid the use of U-clamps and straps. They keep the entire surface of the workpiece free, prevent interference to the drilling operation. They allow a bigger job to be handled on a smaller table.

"Double-Action" Principle

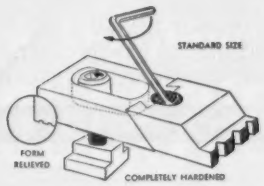
The Tee-Slot Clamp is typical of the entire line of J & S downholding tools. Attaching parallel blocks are integral parts of the clamp, make it a complete unit. Because of its "Double-Action" principle (an exclusive feature of all J & S Jaw Clamps), centering is quick, simple.

There's no distortion in centering. Turn the adjusting screw and the jaw travels straight *in* and *down*. This forces the workpiece horizontally against the opposite clamp and downward against the rotary table.

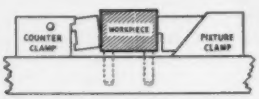
Write for complete information. Fill in the coupon and mail it today.

OTHER J&S WORKHOLDING TOOLS for MACHINE TABLES

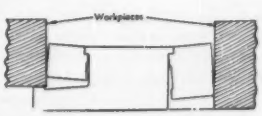
Feature "Double-Action" Principle, exclusive with J&S Tools



J & S "All-Purpose" Jaw Clamps. For use on lathes, planers, milling machines, boring millers, drill presses, etc. Eliminates U-clamps and straps. Sets up easy, fast.



J&S Counter and Fixture Clamps. For rapid loading and unloading. Drawing shows how you can machine one piece at a time, using pins to locate workpiece.



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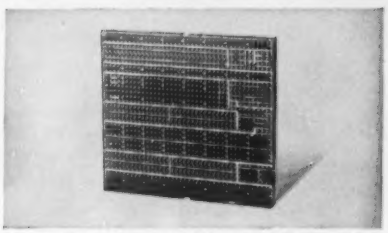
Make Sure You're Not Missing These Tooling Advantages!

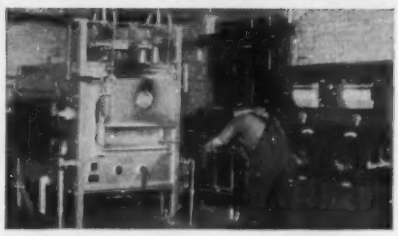
Make this *3-Minute Check* . . . Discover how a *modern* die steel can give you diemaking and production advantages no other steel offers you!

Are you aware of how tool and die steels have been improved in the last 5 to 10 years? New steels are now available that handle easier, run longer between grinds, bring down diemaking costs. Here are facts about *Vega* (Air-Tough) Die Steel—just one steel in Carpenter's Matched Set of 12 modern die steels. Compare *Vega* and what it offers, with the die steel you're using. Check it point by point. You'll see what a difference a Carpenter Matched Tool and Die Steel can mean to *your* production and profits. THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

Here is what *Vega* gives you . . . *COMPARE* it with the die steel *you* use . . .

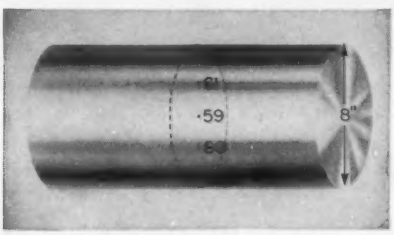


Freedom from Size Change in Hardening. The mold for this 9½" x 10½" plastic control panel has 1,280 5/32" dia. holes, six ⅜" dia. horizontal ports for heating and cooling, plus eight ¾" dia. tapered holes on the edge. *Vega* was the *only* steel of many tried that could successfully hold the close tolerances of .0002" on centers of the 1,280 holes! Will the steel you use behave in hardening like this?

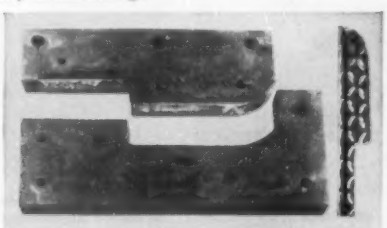


Easy, Low Temperature Heat Treating. You heat treat *Vega* from a temperature of only 1550°F (actually 200°F *lower* than the 5% chromium air-hardening grades!). No need for special, high temperature furnaces! Are you getting the benefits of *low temperature* heat treating from the air-hardening steel you use?

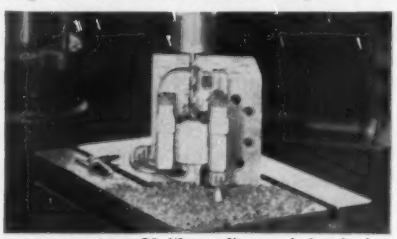
Extra Economy in Hardening. Because of *Vega's* lower hardening temperature, troublesome pack hardening to avoid excessive scaling is usually unnecessary. Does the air-hardening steel you use give you this *extra economy* in hardening?



Uniform Deep Hardenability. *Vega* gives you the advantages of uniform, deep hardenability in very heavy sections. For example, *Vega* hardens to Rockwell C-60 from surface to center in sections as large as 8" round. How does the steel you use compare on this score?



Toughness with Good Hardness. This punch and die blanks ¼" diamond threshold plates at one stroke. With previous air-hardening die steel, tools chipped and broke before any real production was made. With *Vega* these tools are in regular production—and there are no signs of wear or chipping to date. Will the steel you use perform in service like this?



Good Machinability. Unlike ordinary air-hardening grades, *Vega* has a well balanced analysis with a small percentage of hard-to-machine alloys. Field tests prove it to be one of the easiest of all air-hardening grades to machine. If the air-hardening grade you use fails to provide this *good machinability*, you're missing out on lower costs.

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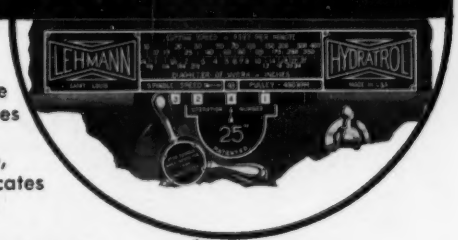

Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The rotary handle provides all speed changes for 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.

Check These Other Important Advantages:

- Safe in operation.
- Simplicity in construction and operation.
- Hydraulic friction clutches and hydraulic brakes, self-compensating.
- Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.
- Spindle release for chucking.
- Perfect, safety-control lubrication with filtered oil.
- Gears constantly in mesh.

Write today for additional information or catalog — or — send prints for time-and-money-saving recommendation!

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The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Pushbutton control provides a fast change from any high speed to the corresponding low speed. This versatility is further increased by 48 choices of longitudinal and cross feeds which insure maximum efficiency on every job. Also, you will

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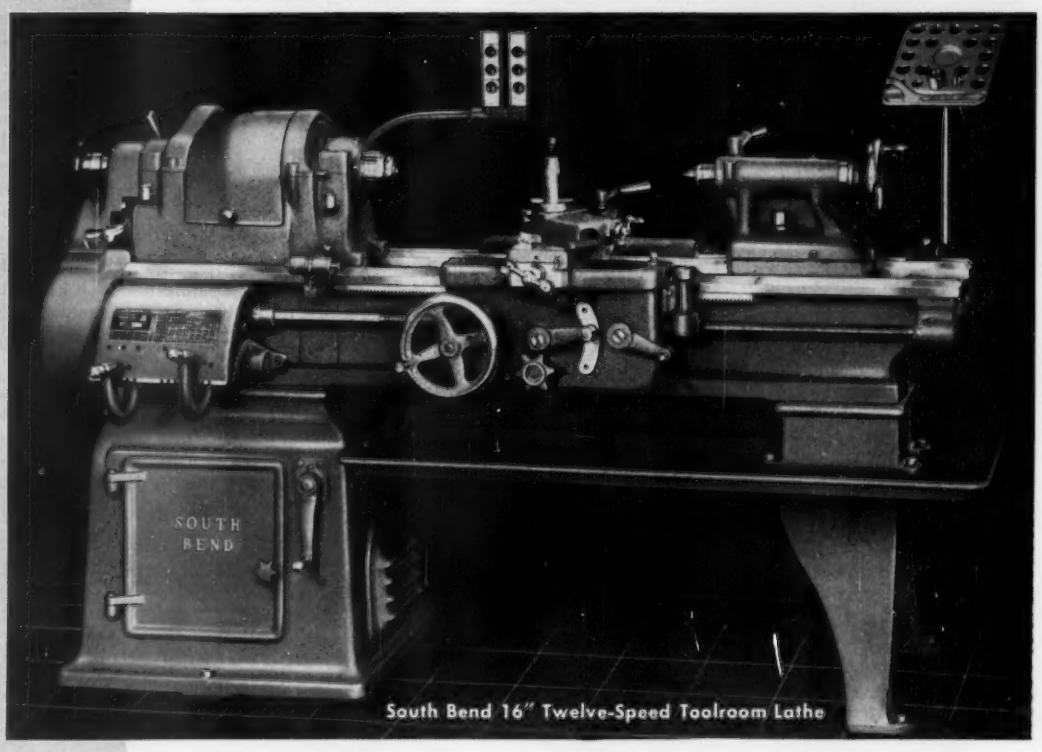
CL8155C, 6' bed, below, f.o.b. factory **$2690.00** less electrical equipment. Time terms available: 10% down, the balance in 12 or 18 months.



South Bend 16" Twelve-Speed Toolroom Lathe

SPECIFICATIONS

Spindle Speeds — 12. Direct drive: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.

Spindle Bore — 1⅜".

Swing over bed and saddle wings — 16¼".

Swing over saddle cross slide — 9⅜".

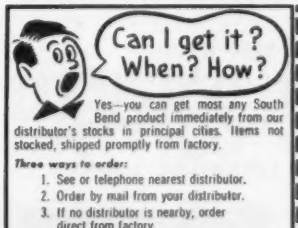
Distance between centers — 33¼", 45¼", 57¼", 81¼", 105¼".

Collet Capacity — 1" maximum.

Longitudinal Feeds — 48 R.H. or L.H., .0015" to .0841".

Cross Feeds — 48, .0006" to .0315".

Thread Pitches — 48, 4 to 224 per inch.



Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms

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☐ 10" to 16-24" FLOOR LATHES

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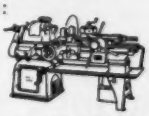
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another great new PLUS...

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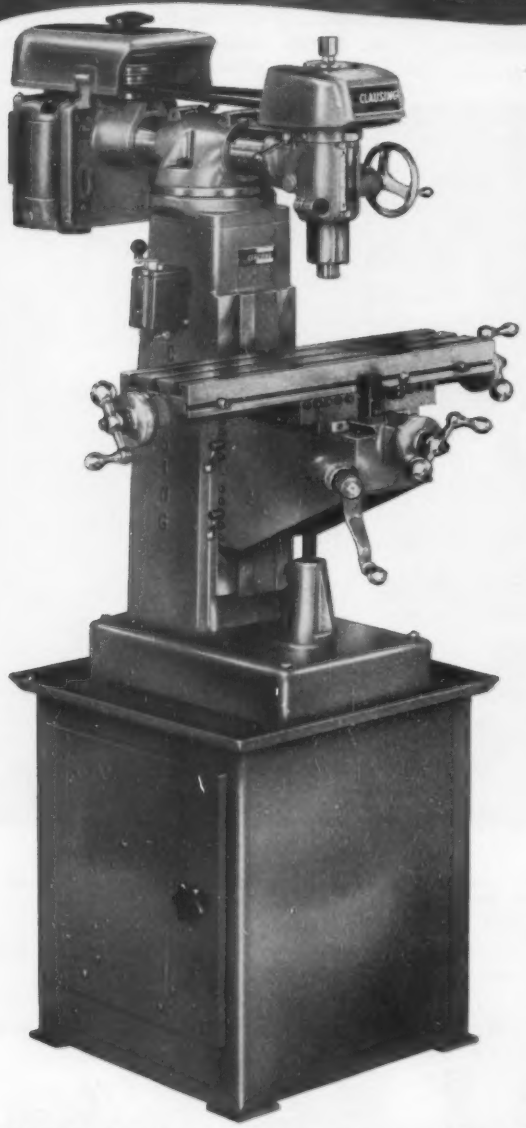

is NOW READY FOR YOU!

For versatility, accuracy and economy, the new Clausing Vertical Milling Machine has more Plus Value features than have ever before been available in a miller at or near its price!

It has Versatility Plus! Especially designed for tool room, pattern shop and general purpose use, it is actually several machines combined in one. The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill, drill, bore, ream and shape at all angles, with one setup.

It has Accuracy Plus! The heart of the Clausing Mill is its rigid, high precision spindle head. It has 7 ball bearings — spindle is chrome nickel steel, hardened and ground — quill, hardened and ground, has honed bearing seats — overarm is rigid steel casting, with ¾" thick walls precision ground — drive has 4 ball bearings.

Quill has micrometer depth control stop and two feeds; rack controlled by lever for sensitive feed and gear controlled by hand wheel for fine feed. All feed screws have ground threads, turn on ball bearings, have large micrometer dials.

Table surfaces and dovetail ways on table, saddle, knee and column are precision ground.

It has Economy Plus! The Clausing has many features that reduce setup and operating costs in both tool room and production milling. It's low in initial investment, and careful selection of materials and precision workmanship assure long service.

Write today for the complete story of this sensational new machine tool!

CONDENSED SPECIFICATIONS

Size of Table	6" x 24"
Longitudinal Table Travel	15"
Transverse Table Travel	5"
Vertical Travel of Knee	12"
Maximum Distance Spindle to Table	12"
Maximum Distance Spindle to Column	8¾"
Quill Travel	3"

Spindle Speeds: Six, 180 to 3250 R.P.M.
No. 7 Brown and Sharpe or No. 2 Morse Taper Spindle Optional
Operates from ½ or ¾ HP, 1725 R.P.M. Motor

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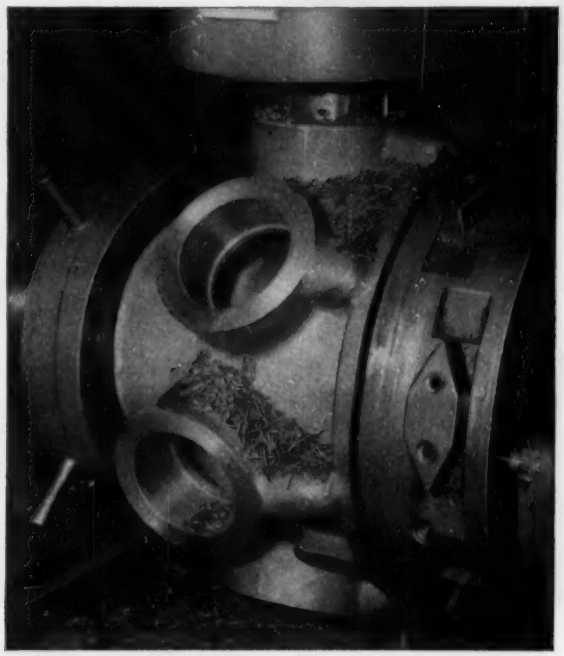
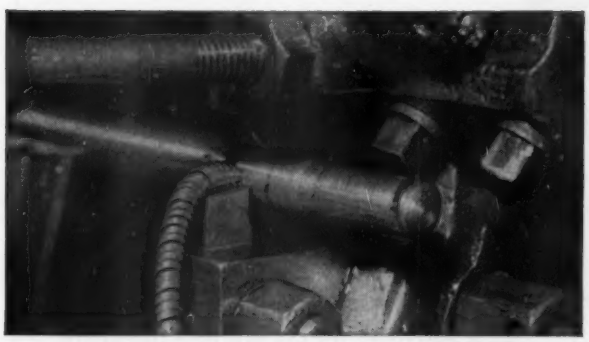
HAYNES STELLITE Tools

2,000 CYLINDER WALLS PER GRIND

The HAYNES STELLITE tools used in this multiple boring head last from 4 to 6 weeks between grinds. The part is a cast iron compressor housing. Machining was complicated by mold sand inclusions and intermittent cuts due to irregular contours and variations in chill depth. Spindle speed is about 45 r.p.m., and machining is done dry.

The 20 HAYNES STELLITE tools used in this boring head (described above) are usually good for 25 grinds.





TOOL LIFE INCREASED FROM 6 TO 12 TIMES

The longer life of HAYNES STELLITE tools saved this plant from 1 to 2 hours each day in grinding time alone. The parts being machined are chromium-molybdenum shafts with a hardness value of 269 Brinell. HAYNES STELLITE tools averaged 80 shafts every 3 hours before they had to be ground. Tools previously used had to be ground every half hour or less, producing as few as 5 shafts per grind.

For further information about HAYNES STELLITE tools, and how they may be useful to you, write for the booklet entitled, "HAYNES STELLITE Metal-Cutting Tools." This practical manual of cutting tool practice is published as a service to you.

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Metal Cutting Tools

The original cobalt-chromium-tungsten metal-cutting tool.

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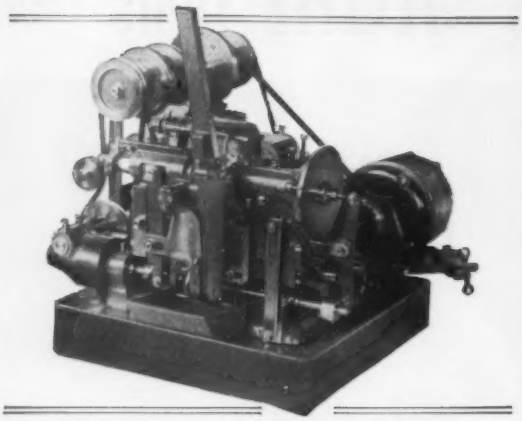

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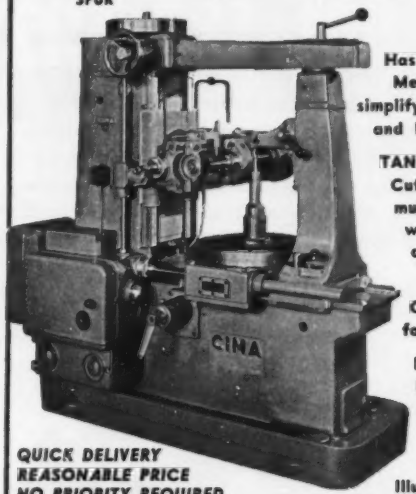

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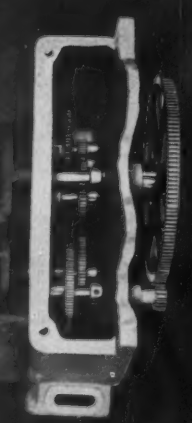

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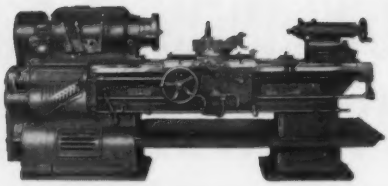

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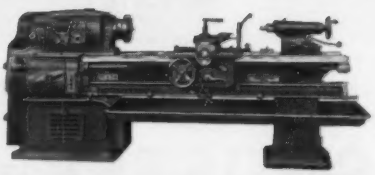
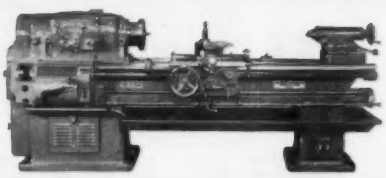
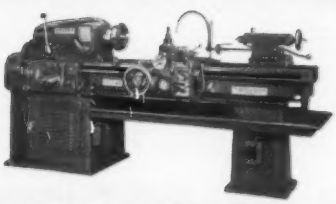


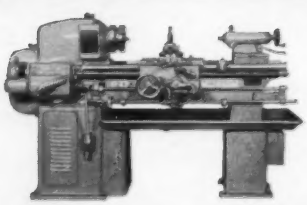
12" — 14" — 16" 18-speed Geared Head Lathes



12" — 14" — 16" 12-speed Geared Head Lathes



No. 2 General Purpose Lathe



No. 1 General Purpose Lathe

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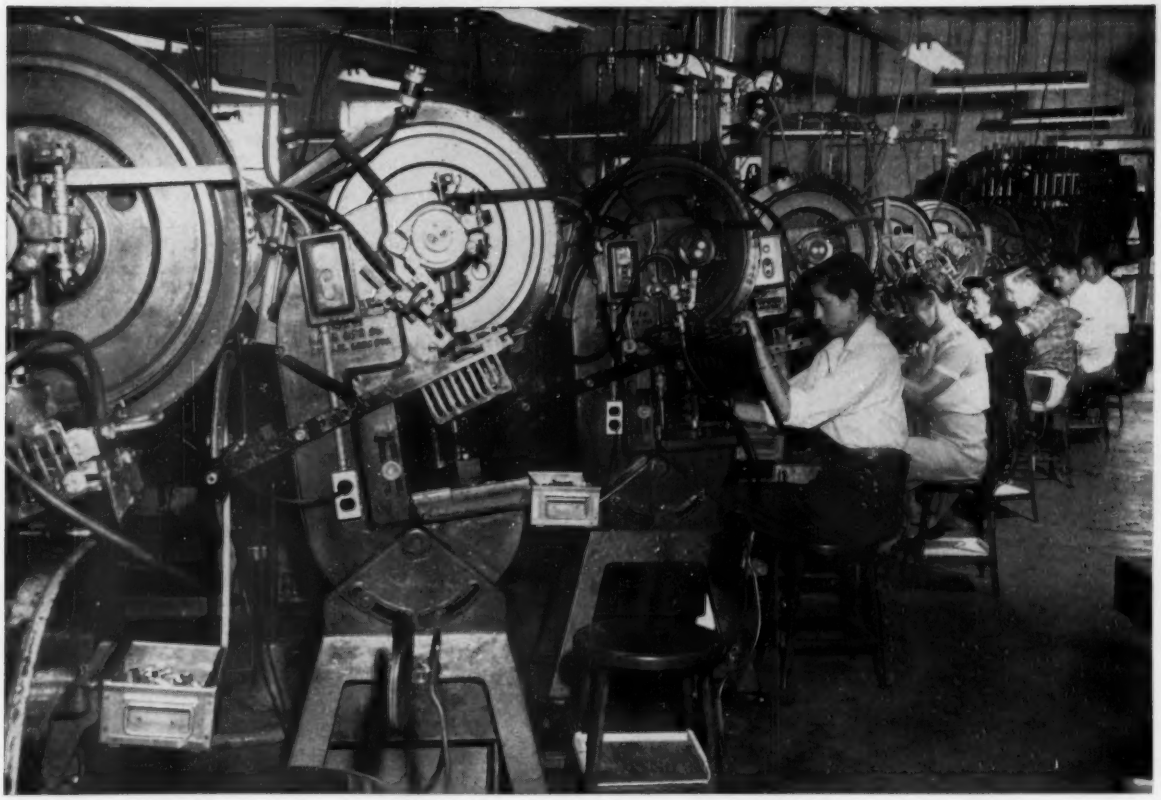
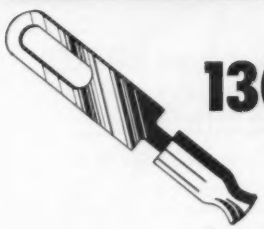


Some of the 36 Press-Rite Presses at Johnson & Hoffman Manufacturing Company, Mineola, New York



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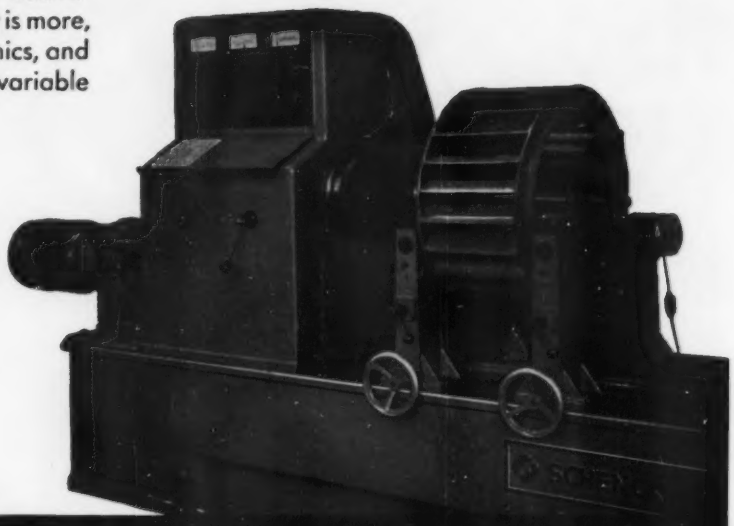

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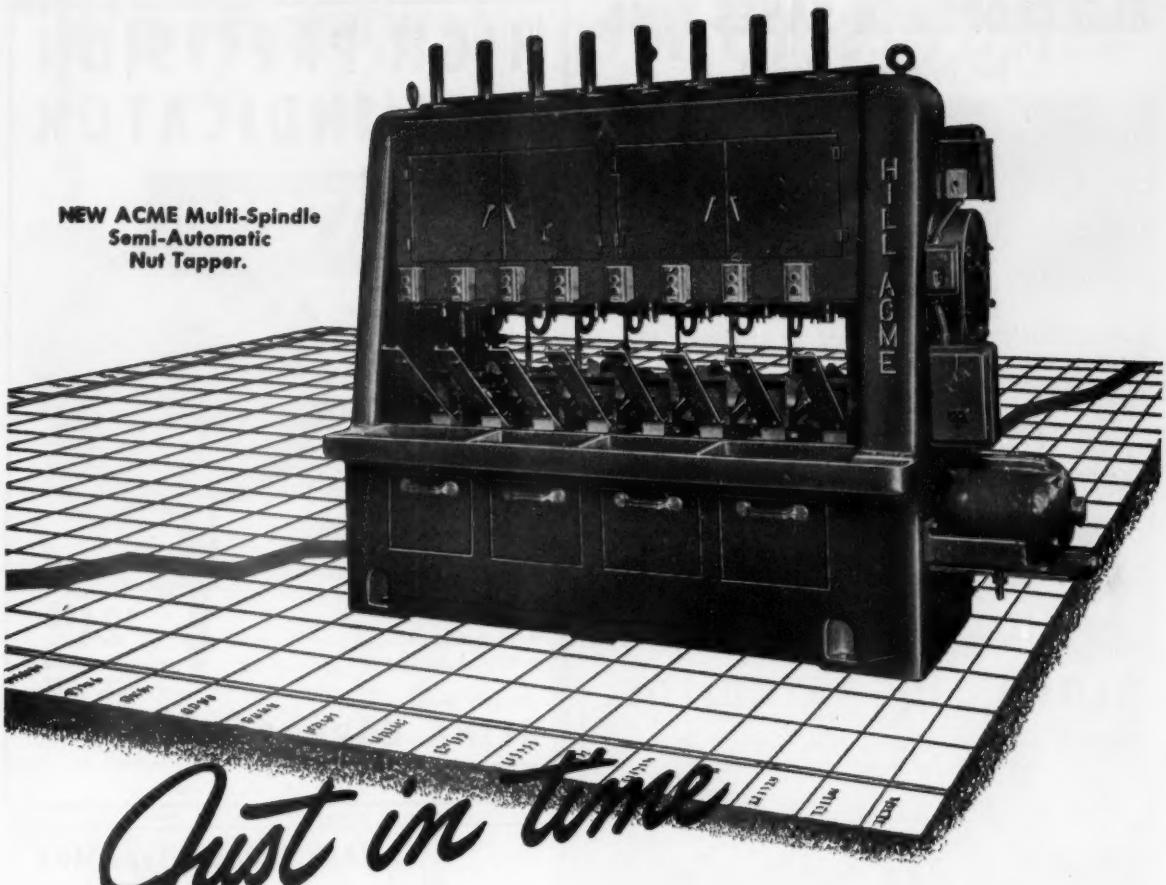

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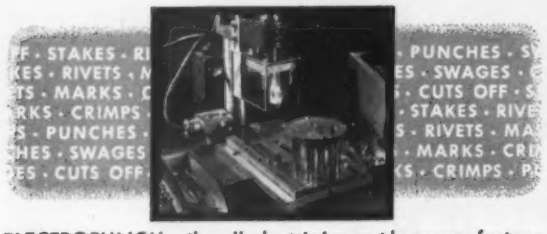

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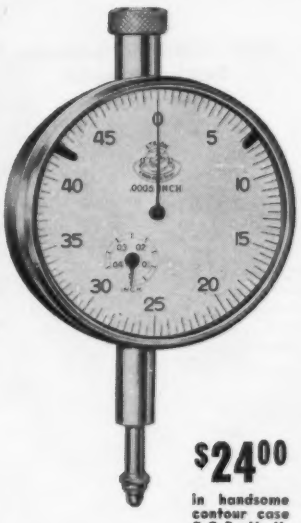

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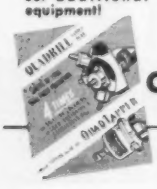

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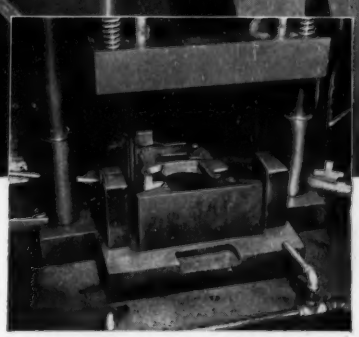
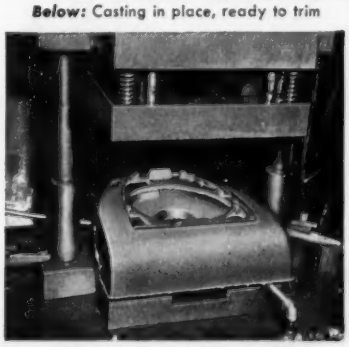
Hoover is now using 14 Multipresses of one-ton, 4-ton, and 25-ton capacities. In addition to manufacturing electric irons, washing machines, floor polishers, and electric motors, Hoover produces die castings for other leading manufacturers.



Above: 25-TON Multipress in operation at Hoover plant in North Canton, Ohio

Above: Close-up of Multipress Tooling
Below: Casting in place, ready to trim



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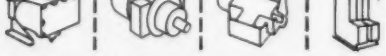

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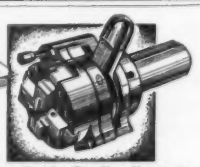

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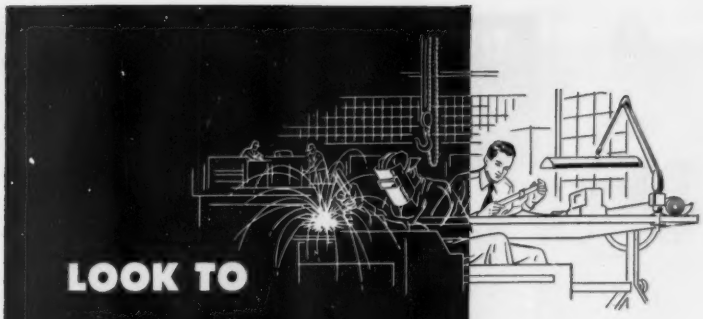

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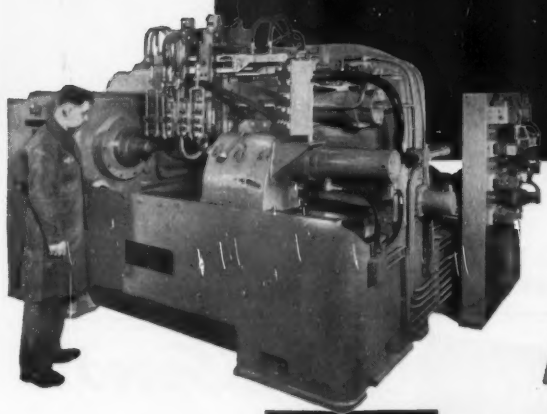
FOR SPECIAL MACHINERY

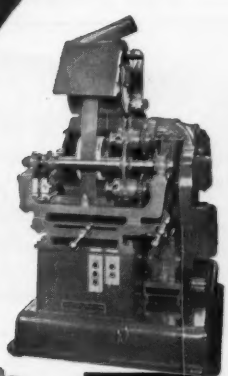
As experienced builders of special machinery, we can fabricate components or complete assemblies to YOUR specifications. We have the extensive welding and machine shop facilities . . . trained engineering personnel . . . and skilled production technicians that are necessary to manufacture non-standard equipment quickly and economically in limited quantities.

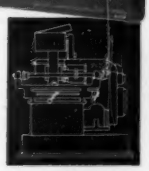
The three units illustrated are typical examples of the work we are doing for others. Each is a complex special-purpose machine.

We would like to discuss YOUR special equipment problems. You supply the specifications . . . we will take care of the rest. Write today, or call BEdford 2-2500, for additional details.

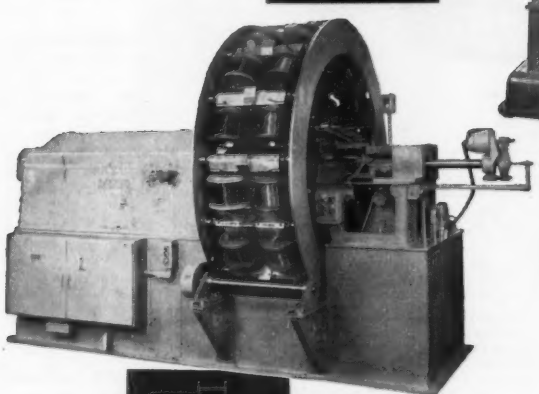


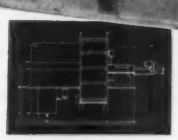
SEMI-AUTOMATIC 100-HORSEPOWER LATHE





ABRASIVE BELT GRINDER





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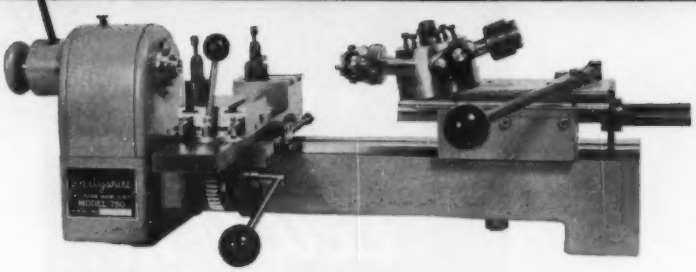
DERBYSHIRE PRECISION LATHE *Model 750*



Lathe, 22" bed, Ball Bearing Headstock with Lever-Collet Closer, Pt. #3804, with Double Compound Slide Rest, Pt. #3652 and Six-position, self-indexing and semi-automatic Turret, Pt. #3610.

SPECIFICATIONS

Overall Length With Lever Chuck Closer	29"
Length of Bed	22"
Height to Top of Headstock	8½"
Height to Top of Lathe Bed	4"
Width of Bed	2⅞"
Width of Ways	1-13/16"
Swing over Bed	5.905" (15 cm)
Swing over Compound Slide Rest	2⅜"
Distance between Centers	12"
Center Height	2.953" (7.50 cm)
Maximum Collet Capacity	.315 (5/16")-(#80 metric)
Maximum Spindle Speed	18,000 RPM
Concentric Running of Ball Bearing Headstock Spindle	.0002"
Spindle Speeds with Variable Speed Drive:	
With Pulley Ratio 1 to 1	600 to 5,000 RPM
With Pulley Ratio 2 to 1	1200 to 10,000 RPM

Delivery from Stock

For full details write:

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157 HIGH STREET • WALTHAM, MASS.

Sonnet's NEW Port Contour Cutter Produces the A.N.D. 10050 hydraulic port contour IN ONE PASS!

Cuts job time ⅔! This new special-purpose cutter has four flutes, with each flute designed to perform a separate operation. A single pass of the cutter completes the chamfering, counterboring, radiusing, countersinking and spot facing operations necessary to produce the A.N.D. 10050 hydraulic port or connecting hole. As a result, time required to complete the job is cut approximately ⅔!

Made from alloy-steel, the new tool is hardened for toughness and carbide tipped for long cutting life and smooth finish. Available with either integral or replaceable pilots.

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NEW Hi-Speed CROWNFLEX CUT-OFF and GRINDING WHEELS

Unbreakable-Elastic-Longer Lasting even at highest speeds. Strong construction enables use on machines running at surface speed of up to 20,000 ft. per minute. Can be used universally for cutting and grinding of all factory materials including hard and soft metals. Standard sizes and grits. Cut-off wheels up to 20" dia., grinding wheels 7" and 9" dia. with depressed center.

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With the Brush SURFINDICATOR, surface roughness measurements can be made on the production line.*

Can this simple check

HELP YOU REDUCE MACHINING COSTS?

The smoother the finish, the higher the machining cost - yet in many plants parts are overfinished because of the lack of proper gaging equipment. For example, if a surface roughness of 125 microinches is specified, and you are finishing to 32 microinches, your machining costs may be as much as twice that actually required for the job.

This expensive overfinishing can be eliminated with the new Brush SURFINDICATOR. It is a practical shop instrument that permits fast accurate measurement of surface roughness on the production line. It is simple to operate, portable, and can save its cost a hundred times over.

Write now for the booklet "Surface Finish Control", which explains how proper surface control can reduce machining costs, increase plant capacity, and improve product performance. Brush Electronics Company, Dept. U-2, 3405 Perkins Avenue, Cleveland 14, Ohio.

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
ULTRASONIC EQUIPMENT

formerly
The Brush Development Co.
Brush Electronics Company
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The SURFINDICATOR weighs only 15 pounds, can be set up anywhere in the plant where 115 volts a.c. is available.

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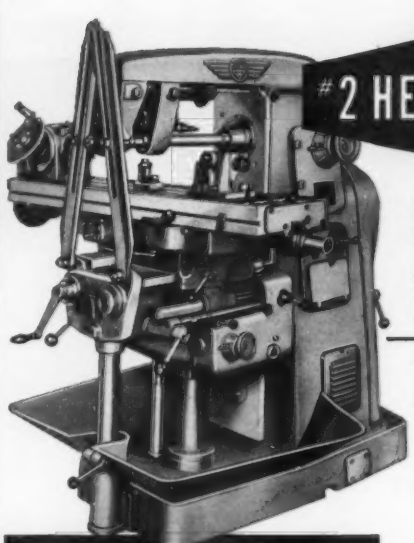

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12" x 51"

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You'll find thousands of money-saving facts about efficient replacement programs there.

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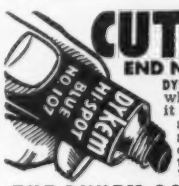

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Puts an actual load of 3000kg on a 10mm ball.
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Test head removable for testing large parts—castings, forgings, etc.
Equally accurate as portable or stationary equipment.
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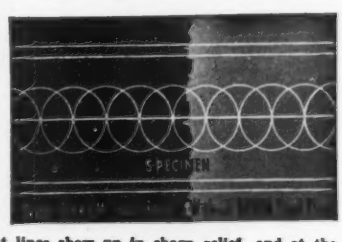

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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THE DYKEM COMPANY, 2301B North 11th St., St. Louis 6, Mo.

Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

GIVE BLOOD

...give it again and again

BUSINESS EXECUTIVES!
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

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(Classified Advertising)

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MASTER MECHANIC

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RW-1506, AMERICAN MACHINIST
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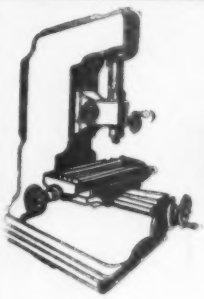

SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

First, read the dealer ads on the following pages. A 5-minute study may locate the equipment now.

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Searchlight Equipment Spotting Service
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Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

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Machinist method man who is thoroughly familiar with various types of turning equipment including knowledge of proper speeds, feeds and tooling for maximum production. If required, must be capable of running this equipment and training personnel. Accustomed to earning over $7000 annually. Plant located metropolitan New York area.

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AUTOMATIC, #2 B & S Wire Feed, 1" screw. Cap.
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BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 2½" Lucas Horiz. M.D.
BORING MILL, Lucas Horiz., 3" Bar, M.D.
BORING MILL, Giddings & L. #0 Horiz. 3½" Bar.
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BRAKE, #335 Chicago, M.D., Press 6', #338.
BRAKE, #185 Chicago Power Apron, 8'3/16" cap.
BROACH, La Pointe 5 ton, 36" stroke, #1 Late.

CHIP WRINGER, 23" Barrett. M.D. with Hoist.
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COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
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DRILL, Edlund #2B, 3 spdle, #2 M.T., 16".
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DRILL, 21" Cinci. Bick Super Serv. Box Col.
DRILL, Natco Multiple Spdle CS, 10 Sp. M.D.
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DRILL, PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S. #4 M.T., 1¾" cap.
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DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
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FILER, Type P4 Oliver Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW. 2100° F cap.

GRINDER, Sanford Surf. 8"x12" cap., New.
GRINDER, #1 Wilmarth Morman Hand Surf., 6"x12".
GRINDER, #2 Imperia Univ. Tool & Cutter, New.
GRINDER, #2 Cinci. Centerless Filmatic, Late Type.
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GRINDER, Disc, Besly #205, 16" Dble End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Sur.
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GRINDER, Greenfield #12 Int. Hydromatic, M.D.
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GEAR SHAPER, Fellows #6 High Speed, M.D.
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INDUCTION HEATER, 10 KVA Ecco HI Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
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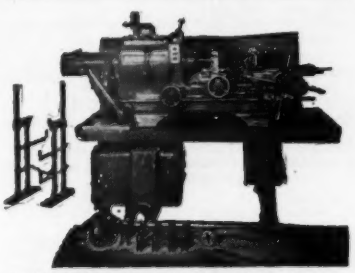
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

2—No. 7 BARDONS & OLIVER Geared Head

Full Universal Turret Lathe, Preselector Head. Bar Feed 2⅛" cap capacity through spindle. Late Type, Motor Driven with tooling.



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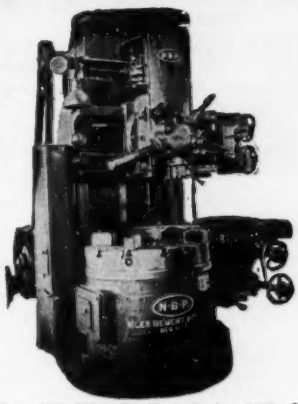
LATHE, Lo-Swing 8"x100", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type.
LATHE, LeBlond 14"x6' Q.C.G. M.D.
LATHE, Hendey 14"x8' Q.C.G., Taper Attach. M.D.
LATHE, American 16"x8' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 16"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Road-prentice 20"x10' Grd. Hd. M.D.
LATHE, 20"x16' Road Prentice Grd. Hd., Late Type
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd Hd.
LATHE, Lodge & Shipley 26"x14' Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Bulling Dble. End &VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #5 Warner & Swasey Univ. Late.
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret #3A Warner & Swasey Univ. M.D.
LATHE, #601 Oster Hand Turret, M.D., Late Type.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, No. 1 U.S. Hand, Late Type, M.D.
MILL, #1-14 Kent-Owens Hyd. Late Type.
MILL, No. 1½ Milwaukee Plain Horiz.
MILL, #2 Kempsmith Maximiller Horiz., Vert. Hd.
MILL, #08 Cinc. Vert. Prod. Rotary Table.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3B K & T Horiz., M.D.
MILL, #3B K & T Vert. M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
MULT-MILLER, U. S. Tool #MM-1-6 Auto. Prod.
MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, #0-8 Cinc., Horiz. Rise & Fall, Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical HI Power, M.D.
MILL, #5C Baker Vert. Die Sinker, M.D.
MILL, 42"x36"x12" Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen Electric, 100 K.W.
NIBBLER, #136 Savage 36x3/16" Cap., M.D.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

42" Late Model KING Vertical Boring Mill. A.C. Motor Drive; 5 position turret head; Right Hand Side Head; 4 jaw Chuck table; Bijur System, Pendant control. New 1946. Excellent condition.

NAILING MACHINE, No. 18—43"-54" Morgan, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x20" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & D873 Ferracute, Redraw, M.D.
PRESS, #2½ & #5 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 75 & 90 tons, New.
PRESS, #59¼ Toledo Str. Side, M.D., 440 tons cap.
PRESS, 70H & 125PA Drake Hyd. Arber, New.
PRESS, #78½ Bliss tr. Side, 400 ton cap. M.D.
PRESS, Bliss #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 68 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #60 Whitney Deep Thr. 24" foot.
PRESS, P2, P3 Ferracute M.D. Rool feed.
WHEEL PRESS, 600 ton Niles-Bement-Pond, A.C.
PANTOGRAPH, #1A Garton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hooker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".

RIVET SETTER, #140 Chicago M.D., ¼" cap.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, #1, #2 Buffalo Forge Vert. Angle Bending.
ROLLS, 72"x½" Lewis Initial M.D., New.
ROLLS, 72"x12 ga. Wysong & Miles, Initial Type

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radiac "17" DeSanno.
CUT-OFF SAW, Yates-American #14-90, M.D.
SAW, #8 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, 10"x10" Racine Hyd., Late Type, M.D., #30C.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW, V-26 DoALL Bandsaw, Late.
SHAPER, 16" Newark, Vise, M.D.
SHAPER, 20" Gould & Eberhardt V-ways, Vise, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, 32" Cinci., B.G., Motor Driven, M.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 10' x 10 ga. cap. Wysong & Miles, M.D.
SHEAR, 10' x ¼" cap. Wysong & Miles, M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCROPER, Anderson Power Unit. Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Drives, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #20, #30 Waterbury Farrel.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model QT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER, Type 03DR. Steel City.
WELDER, 500 amp. Westinghouse Flexors A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Aems, M.D

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1941-1954 MACHINE TOOLS

CUTTER & TOOL GRINDERS
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle, 8" overhang
ALLEN: #2 High Speed 15"
PRATT & WHITNEY: ⅛B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' & 7', new

GEAR MACHINERY
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)
PRATT & WHITNEY: Gear Grinder, 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 cap. 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts

GRINDERS CYL.—*continued*
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL
BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless
HEALD: #73 Centerless Internal Grinder

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649-16, cap. 6" to 16" dia.
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD
EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES—PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers

LATHES—TURRET
BULLARD: 36" Vertical turret
WARNER & SWASEY: #1A, #2A, #3A & #4A
WARNER & SWASEY: #3, #4 & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed

THREAD MILLERS & TAPPERS
HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to ½" dia. capacity, single spindle

MISCELLANEOUS
OPTICAL PROFILE GRINDER: Wickman New
OPTICAL PROFILE GRINDER, Sheffield, used
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE, Wickman, Single Spindle, 7/16" New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
SUNDSTRAND: Double-End, #53, 42" & 60" Centering Mach.
WIRE FORMING MACHINES: 4-slides (new)

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LATE TYPE MACHINE TOOLS

No. 41 Lucas Horizontal Boring Mill. 1941.

HP-100 LaPointe Horizontal Hydraulic Broach. 1945.

No. 7 Gleason "Revex" Gear Rougher. 1943.

16"x72" Norton Univ. 1942.

No. 35 Excello Precision Thread Grinder.

No. 2 Cincinnati Centerless Grinder. 1944.

24-36-Bryant Hydraulic Internal Grinder. 1942.

No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.

No. 24 Mattison (Hanchett Type) Duplex Grinder.

No. 16A Blanchard Automatic Surface Grinder. 1942.

No. 6DRE Potter & Johnston Automatic. Late.

1" RA-6 Nat. Acme Automatic 1941.

No. H5 Libby Universal Saddle Type Turret Lathe. 1939.

No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.

No. M-18 Kearney & Trecker Simplex Mill. 1943.

650 Ton Verson Double Action Eccentric Press. 1940.

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Indianapolis
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1961 SOUTH MERIDIAN STREET
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McDONALD
USED MACHINERY

Columbia 10' Power Square Shear 3/16" cap.
Baush 44" Vert. Boring Mill 2 heads
Knight #40 Vert. Jig Borer
American 20"x8' Grd. Hd. Lathe motor in base
Landis 20"x72" and 18"x96" Plain Ext. Grinders.
Hanchatt 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Red Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf Grinder 26" chuck.
Campbell No. 213 abrasive cut off 1944.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Ret. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Belt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller. 2 Tables.
Foote-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
L & N. 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 28" stroke open-side Shaper Planer.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

"LOOK THESE OVER"

3'11" DRESES Radial Drill—Motor on arm
12x30" MONARCH Geared Head Lathes
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 5A BRYANT Internal Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
8"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
24"x276" LANDIS Type "B" Roll Grinder, M.D.
12x18x40 THOMPSON Type "B" Surface Grinder —1951
Nos. 4D and 6S POTTER & JOHNSTON Automatic Lathes
1L GISHOLT Union Turret Lathe, 1946
No. 8A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper.
100" BETTS Vertical Boring Mill, 2 heads.

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STEEL SHEAR

One ¼" x 10' Dries & Krump All Steel Shear complete with electrical equipment. First class condition. $5000.00.

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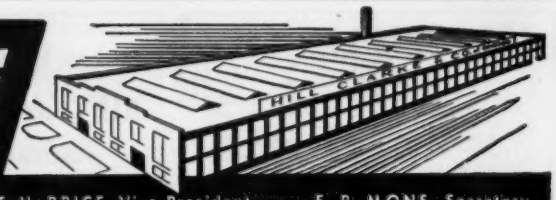

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Partial List

Automatics

1-1/16" Cleveland Model A (1942).

Boring Machines

No. 45—4½" Gidd. & Lewis Hor. Bar.
100" Niles-B-Pond Vert. Bor. Mill.

Drills

No. 2 Avey Cam Fd. Drill. 14" Swing.
2 Spdl.—24" SW.—No. 3 Avey.
D-31 Fox Multiple.
No. 57H Fox 24 Spindle Multiple Drill (1943)
1 Spdl.—30" Sw. No. 4 Taper Aurora.

Gear Machines

11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
615-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.
No. 64 Fellows Gear Shaper.

Grinders

6" x 18" Landis Type C (1942).
6" x 18" Norton Type C Plain (1943).
10" x 36" Norton Type C Grinder.
10" x 36" Norton Type C cam Grinder.

Internal Grinders

No. 1109 Bryant Internal Gdr. (1951).
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16A-16 Bryant Internal Grinder.
No. 16-28 Bryant Int. Grinder.
No. 16 A-28 Bryant Internal Grinder.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 81 Heald Internal Centerless.

Hill-Clarke Norton Type Motor Driven Grinders

10" x 36" Centers. 14" x 36" Centers.
10" x 72" Centers. 14" x 50" Centers.
10" x 96" Centers. 14" x 72" Centers.
18" x 96" Centers. 14" x 96" Centers.
18"-30" gap x 96" Centers.
24" x 264" Centers.

Hones

Model H-2 Micromatic Horiz. Hone.
Model 200-H5-Dbl. End Micro. Horiz.
Model H-7 Micromatic Vert. Hone

Lathes

R-14 Lo Swing Automatic Lathe.
18" x 6' Am. Geared Head Lathe.
18" x 8' Lodge & Shipley Grd. Hd.
27" x 12' American Geared Hd. Lathe.
27" x 12' centers LeBlond Lathe.
36" x 18' Putnam Grd. Hd. M.D.

Turret Lathes

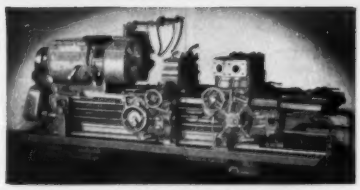
No. 5W Acme Tur. Lathe (Late).
No. 3AL Gisholt, Cross-Slide Turret.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head.
2½" x 24" Jones & Lamson.
18" Libby, M.D.
No. 4A Warner & Swasey (1944).
No. 4A Warner & Swasey, Taper, Cross-sliding Turret (1942).

Planers

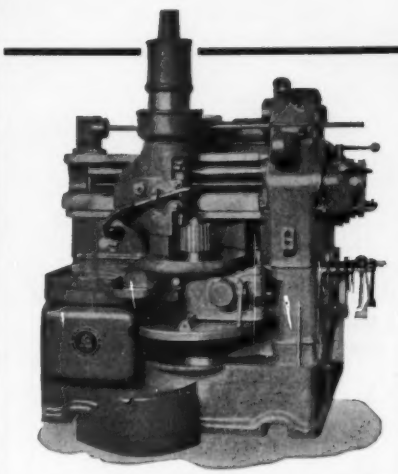
48" x 36" x 14' Gray, 2 Heads.
48" x 48" x 12' Cincinnati, 2 Heads.
60" x 48" x 27' American, 4 Heads.

Milling Machines

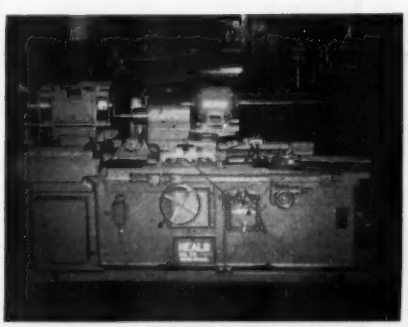
54" Ingersoll Vertical Adjustable Rotary Mill.
No. 3K Milwaukee Vert. Mill (1942).
No. 08 Cincinnati Vert. (1942).
No. 12 Cincinnati Pl. Auto.
4" Taylor & Fenn Duplex Spline.
6" x 168" Pratt & Whitney Thrd. Mill.
10" x 48" Hanson-Whitney Thrd. Mill.
10" x 60" Pratt & Whitney Thrd. Mill.
12" x 102" Mod. HT Lees Bradner Thrd. Mill.
54" x 30" x 16' Ingersoll Slab Mill.
No. 34-36 Cincinnati Hydro.



No. 3AL GISHOLT UNIVERSAL HEAVY DUTY TURRET LATHE, 20 HP AC Main motor, hard steel ways, cross sliding turret 27" swing, *Serial No.* 929-19 (1941)



No. 615A Fellows Gear Shaper, 3 HP. A.C. Motor-in-base, capacity 18" Pitch diam. x 5" face. *Serial No.* 16513



NO. 74 HEALD CENTERLESS INTERNAL GRINDER 7½ Hp. 220/440 volt Main Motor, A.C. Hydraulic, Wheelhead- and workhead motors, 21" Swing. *Serial No.* 24603

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BROACHES

5 ton No. 1 Foote Burt Duplex vertical surface
10 ton 48" stroke American horizontal hydraulic
10 ton 56" stroke Oilgear Model 3XA horizontal
12 ton 24" V-2 American vertical hydraulic
15 ton 36" Colonial single ram vertical surface
18 ton V-42 American hydraulic vertical

DRILL PRESSES

20" No. 2 Colburn heavy duty
20" and 24" No. 217 Baker heavy duty
24" No. 321 Baker heavy duty
No. 310 Baker heavy duty
Natco double end horizontal, 2 way
12 spindle No. 12 Natco multiple
22 spindle No. 14 Natco multiple
34 spindle No. A16 Natco multiple
30" swing Allen power feed sensitive
20", 21" and 24" Cincinnati upright
No. 36HO Baker vert. hydraulic drilling and boring
No. 15½ Foote Burt hydraulic vertical
No. B250H Natco hydraulic vertical
6-spindle Kent semi-automatic horizontal
7-spindle Moline horizontal hydraulic
3½' arm 8" column American sensitive radial

GEAR HOBBERS

No. 3 Barber Colman
No. 12 Barber Colman
Type A Barber Colman universal
No. 12H Heavy Gould & Eberhardt universal
No. 36H Gould & Eberhardt
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72" No. 179 Gardner horizontal disc
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No. 72A3 Heald Gagematic internal
No. 72A3 Heald Sizematic internal
No. 5 Bryant internal
No. 16A Bryant 2 spindle hole and face
24-36 Bryant internal hole
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8"x22" No. 3 Abrasive surface
12"x48" Model 300 Hanchett surface
8"x24" No. 5 Brown & Sharpe surface
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Cincinnati face milling cutter grinder
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38" Covel Hanchett Model GK-36 knife grinder
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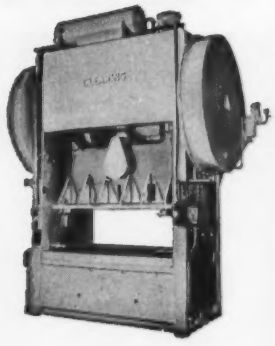

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Gorton Ped. Type Tool Grinder Mod. 375-2
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Heald 72A3 Int. Centerless Sizematic
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Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
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Cinn. #3, 4 Plain, #18 Mfg, #5-48 Hydro.
Kent Owens IV, 1-8, 1-14, 1M, 2-20
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MILLS, VERTICAL
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Cincinnati #3, 08 Vertical
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Gorton 8D Super Speed
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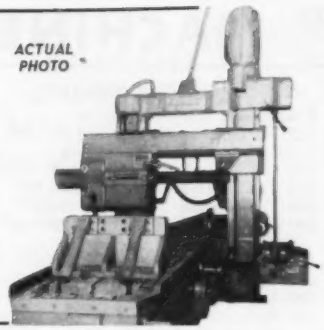

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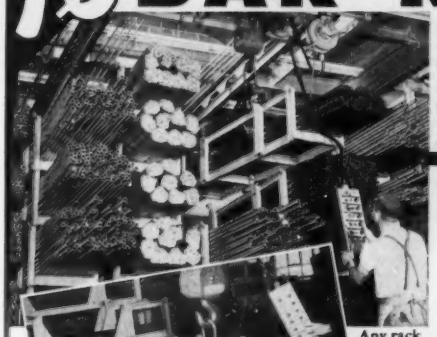

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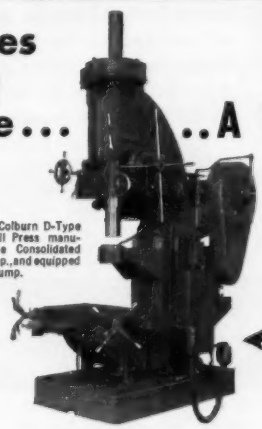

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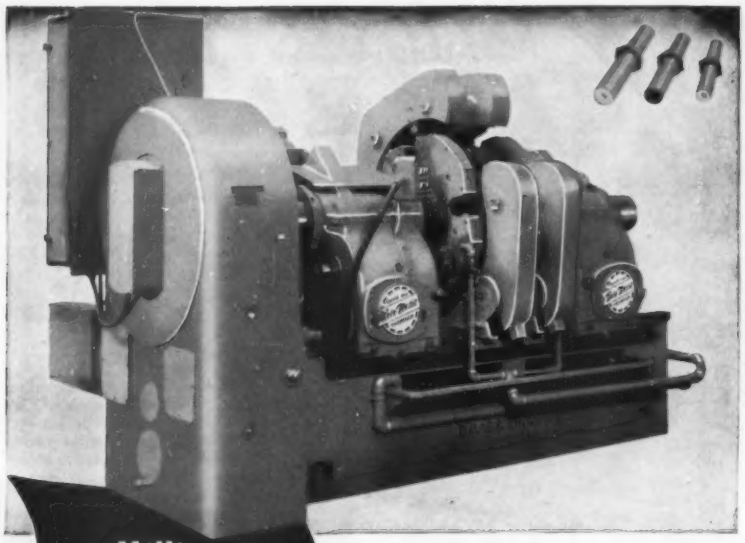

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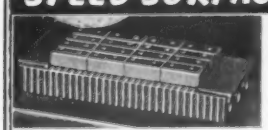

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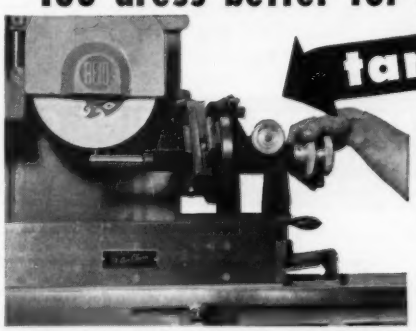

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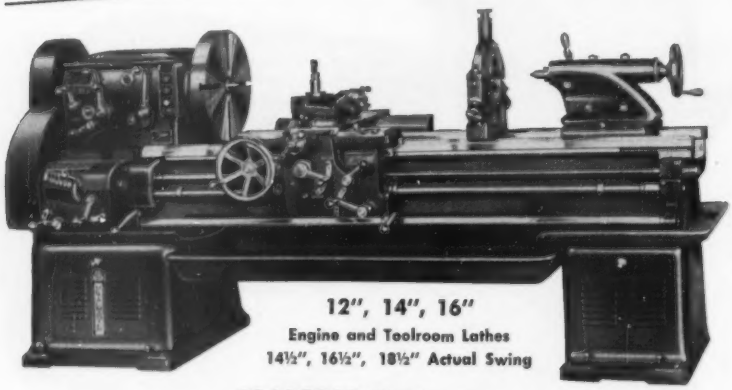

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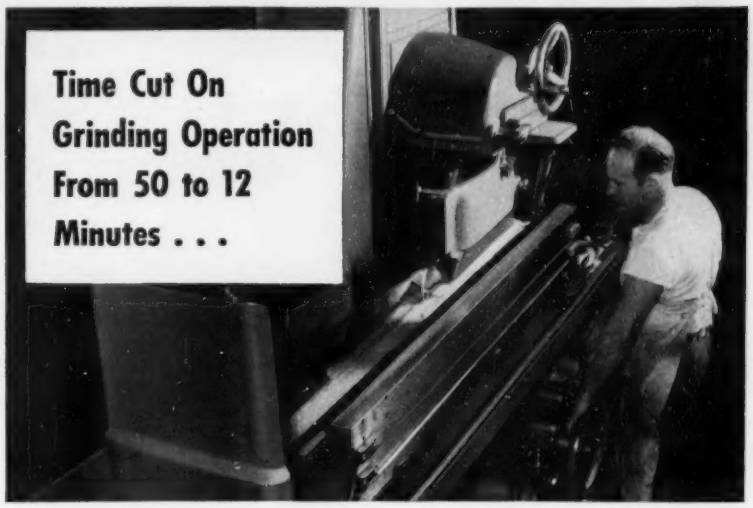

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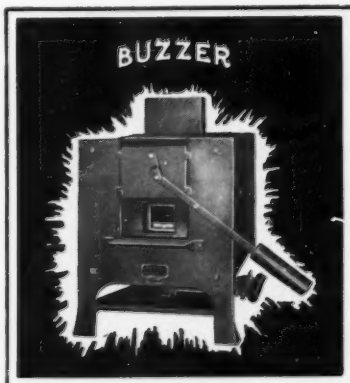

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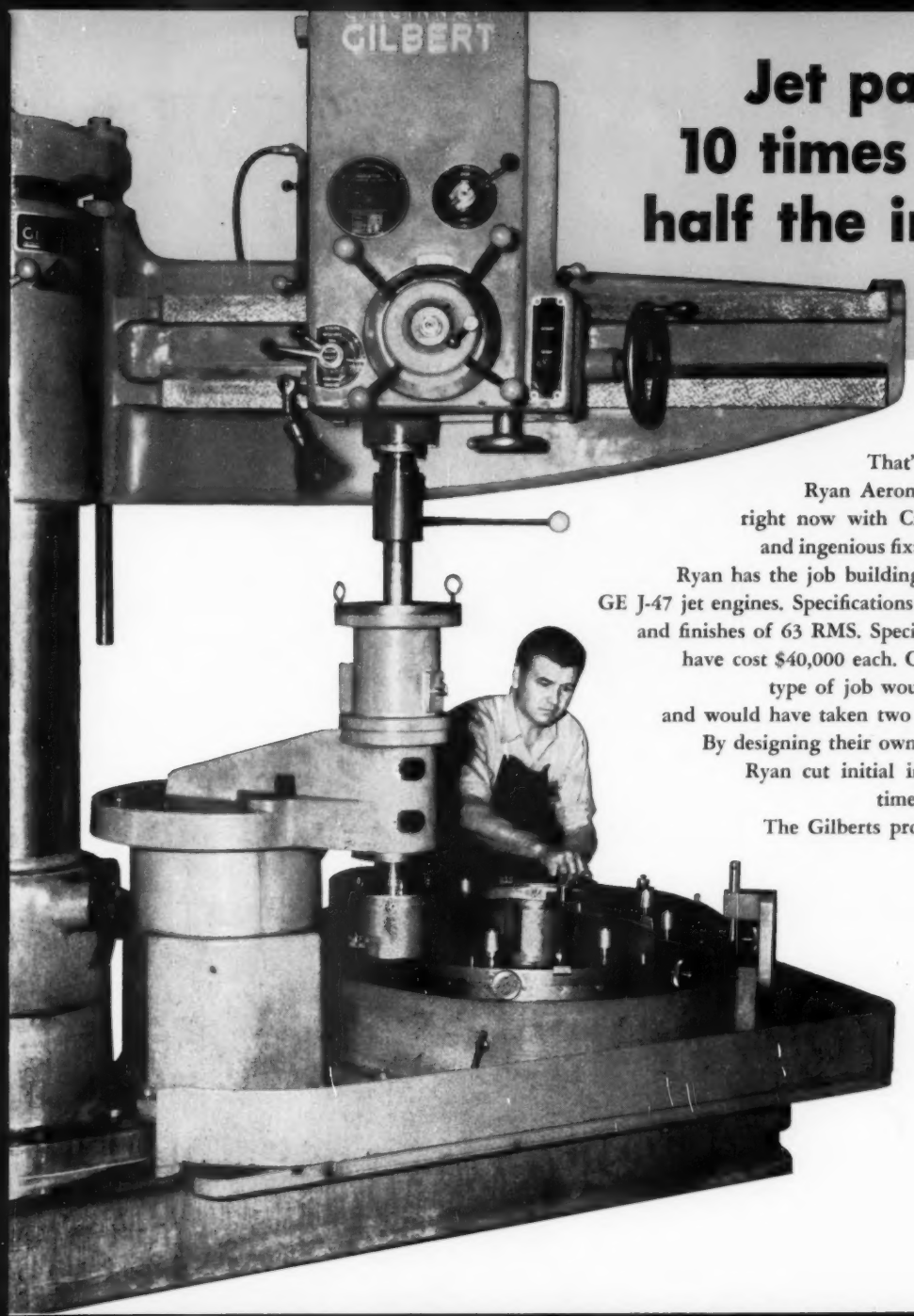

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